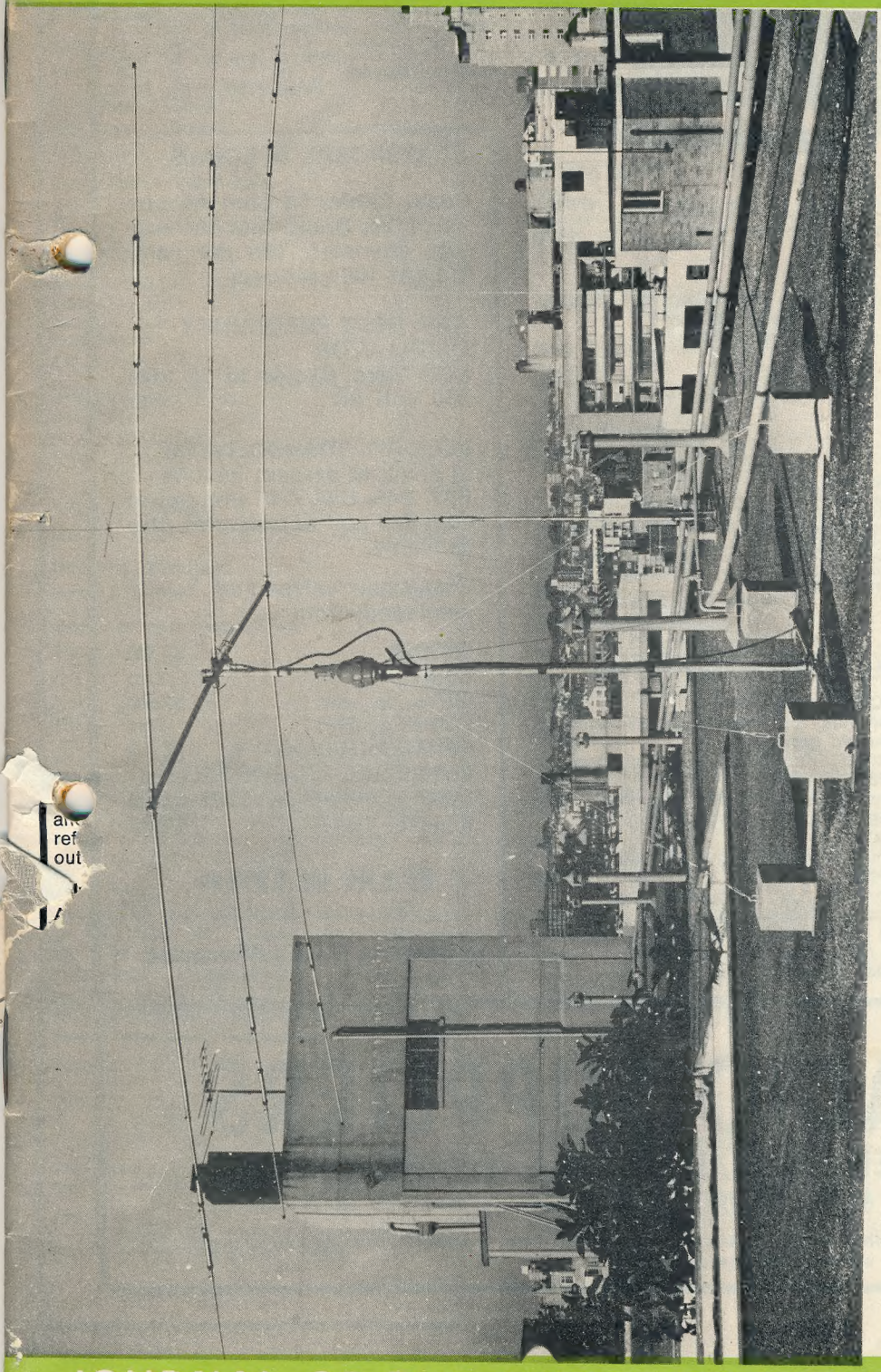
amateur radio

DECEMBER, 1974
VOL. 42, No. 12



The high rise antenna farm of Eric VK2BEK. See article on page 9.

CONTENTS

TECHNICAL —

A Digital Readout for Transceivers 7
A Review of the ICOM IC22 10
Commercial Kinks 18
High Rise Antenna 11
Newcomers' Notebook 18
Telecommand and Telemetry of the Oscar 6 and 7 Communications Satellites — Part 3 12
Try This 18

GENERAL —

Index to Volume 42 — January to December 1974 21
John Moyle Memorial National Field Day Contest Rules, 1975 22

DEPARTMENTS —

Awards Column 23
Contests 22
Hamads 24
Key Section 20
Letters to the Editor 20
Magazine Index 18
Project Australis 23
QSP — 1975 Subscriptions 6
Silent Keys 33
VHF-UHF — an expanding world 19
YRCS 23
20 Years Ago 24

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA

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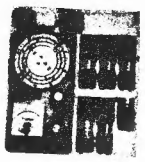
SPECIFICATION



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A Coil 0.44—1.3MHz
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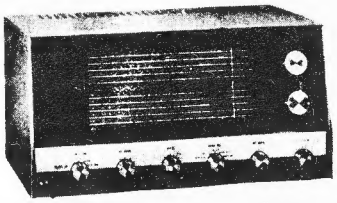

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amateur radio

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DIVISIONAL BROADCASTS

Do you have the time and want to keep in touch with events? If so here are the latest details available of Divisional broadcasts.

VK1WI

Sundays 10.00 Z —
3595 kHz
27125 kHz AM
146.5 MHz FM
BC Committee VK1VP, IMP, 2YS/1.

VK2AWI

11.00 local time Sundays:
3595 kHz AM
7146 kHz SSB
52.525 MHz FM
53.866 MHz AM
145.13 MHz AM
Hunter Branch Mondays 19.00h 80m.

VK3WI

10.30 local time Sundays:
1825 kHz AM
3600 kHz SSB
7146 kHz SSB
144.5 MHz AM
Ch1 FM
(subject to availability at present of relay stations whilst under re-location).

VK4WI

09.00 local time Sundays:
3580 kHz AM
7146 kHz SSB
14342 kHz SSB
re-broadcast on Ch B FM. BC officer VK4HB.

VK5WI

23.30Z Sunday mornings originating on 1.8 MHz band and relays as follows—
3.615 MHz by VK5ZQ
7.125 MHz by VK5NB
14.170 MHz by VK5TY
52.2 MHz by VK5ZEG
Ch 48 by VK5WB
VK8CM in Darwin on 2m
VK5DK in Mt. Gambier on 2m

VK6WI

09.30 local time on Sundays:
3600 kHz SSB
7080 kHz SSB
14100 kHz SSB
52.656 MHz FM

VK7

09.30 local time on Sundays originated on Mt. Barrow 2m repeater VK7RAA and re-broadcast in Launceston area 3672 kHz SSB, 7130 kHz AM and in Hobart area on 53.032 AM, 144.1 MHz AM, 146 MHz FM and 432.1 MHz AM.

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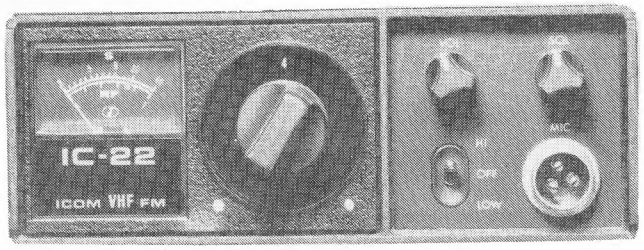

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QSP

★ W.I.A. Members are reminded that notices for their 1975 subscriptions will soon be on the way to them, but read on.

★ As in previous years, the annual subscription rates are composed of several elements.

★ In simplest terms, each subscription comprises a Federal part and a Divisional part. The Federal part is determined each year in advance by the Federal Council and for 1975 is $9.80.

★ The Divisional part is the difference between the Federal Part and the total subscription rate which is determined separately for each grade by each Divisional Council.

★ Because of centralised processing of subscriptions done on a strictly commercial and audited basis subscriptions are payable direct to the W.I.A. Executive office, P.O. Box 150, Toorak, Vic. 3142.

★ The office retains the Federal part of the subscriptions and remits to each Division from time to time the Divisional portions of all the subscriptions received.

★ The processing of subscriptions forms part of the EDP system from which address labels for AR are produced.

★ AR address labels are automatically suppressed for those members who remain unfinancial after a short period of grace covering the first issues of the year; missing issues are not sent.

★ If AR is undelivered and is returned to sender the address label is forthwith suppressed until a fresh address is received from that member.

★ Missing issues of AR are despatched with the next bulk postings where it was no fault of the member that he did not receive them.

★ AR costs a lot of money to produce and distribute and absorbs the leisure time of a great many volunteers.

★ The 1975 notional element for AR in each member's subscription is $5.04 for the whole year — this is only 42c per issue and is the main portion of the Federal part of subscriptions.

★ The Federal part also includes 30c IARU levy and not less than 50c towards the costs of the annual Federal Convention previously funded out of Divisional monies. The $3.96 balance making up the total Federal dues of $9.80 goes towards the expenses of the Executive and the Executive office.

★ The full metropolitan member rates for 1975 have been set out by each Division as follows—

	Div. portion	Grand Total
VK1	$5.20	$15.00
VK2		
VK3	$7.70	$17.50
VK4	$5.20	$15.00
VK5	$5.70	$15.50
VK6	$5.20	$15.00
VK7	$2.20	$12.00

★ The metropolitan associate member rates for 1975 are —

	Div. portion	Grand Total
VK1	$5.20	$15.00
VK2		
VK3	$7.20	$17.00
VK4	$5.20	$15.00
VK5	$4.20	$14.00
VK6	$3.70	$13.50
VK7	$0.20	$10.00

★ Lower subscription rates apply for pensioners, students, families and juniors in the the EDP grades S, G and X. The Federal element for those who receive AR (S and G grades) is $5.04 AR plus 30c IARU making a total of $5.34 for the full year 1975. This is a flow-on from a Federal Council decision.

★ The Divisional portion of subscriptions is applied by the Division towards the costs of providing or maintaining the Headquarters facility including, in the case of NSW and Victoria, a paid Administrative Secretary and office functions. The Division also provides liaison with the local Radio Branch and other organisations, broadcasts, beacons, repeater facilities and bulletins, classes and YRCS, WICEN and VHF activities, equipment, components and publications sales and numerous other functions including QSL Bureaux, perhaps a library, technical advice and general assistance to individuals or groups.

★ The Federal part of subscriptions goes towards the costs of AR and providing for the Executive office and staff to process subscriptions and membership records. The Executive co-ordinates and carries out WIA policies as determined by Federal Council, negotiations with Federal bodies such as the Central Office of the Radio Branch, organisation of all-Australia awards, contests and the like, liaison with overseas sister Societies and support for the IARU and IARU Region 3 organisation. The Executive Office also handles "Magpubs" activities, printing the Call Book and other items such as certificates, awards and leaflets, advertising in AR and the Call Book and many other central functions.

★ Unfortunately virtually nothing can escape the effects of inflation. The Institute needs your continuing support.

EXECUTIVE

CW NETWORK

From Sunday 20th October, the CW net will run on 7025 kHz from 10.00 a.m. E.A.S.T. to 12 noon. The SSB commentary will be held only after the CW net on the last Sunday of each month. The frequency will be from 7045-7050 kHz to avoid QRM with RTTY operation.

VK2AV for CW net

NZART 1975 CONFERENCE

"The conference committee would like to extend to our fellow amateurs from across the sea an invitation to attend our annual conference of NZART" writes ZL1AYQ, Publicity Officer for the conference to be held from 31st May to 3rd June 1975, in Rotorua of geyser fame. He suggests that any VK intending to tour New Zealand should do so about that time so as to include the conference in their itinerary, at which they will be made most welcome. Write for further details to the Conference Secretary, P.O. Box 1984, Rotorua.

There is a conference net on the 4th Thursday of each month at 08.00 Z on the 80 m band outside our allowable frequency range (on 3.725 MHz).

IARU REGION 3 ASSOCIATION

The Singapore Amateur Radio Transmitting Society (SARTS) has been admitted to membership of the IARU Region 3 Association thus bringing the total membership of the Association up to nine.

LOGGING REQUIREMENTS IN THE U.S.A.

"Now that FCC, in all its magnanimity, has come forward with reduced logging requirements for amateur stations, the amount of paper work in connection with operating an amateur station figures to decrease drastically" writes W1NJM in the Operating News column QST Sept. '74. "In fact", he says, "all your log will really tell you is when (i.e. what date) you started operating from your present location, and the dates between which you operated from any previous locations". He goes on to say though that all amateurs are urged to continue to keep an accurate and detailed log of their station operation, just as they have always done — whether required by FCC rules or not.

SCL LOGIC

"This new logic", writes Jim Fisk in Aug. '74 Ham Radio Editorial, "which is called SCL (for space-charge-limited) outperforms all other logic, power-wise, at switching rates over 1 MHz. Cmos circuits, while low-power kings at the lower frequencies, require more power than SCL devices at frequencies above 1 MHz. Furthermore, SCL devices theoretically should have all the low-noise performance of vacuum tubes because they have the same built-in noise cancellation that comes with space-charge-limited current flow".

WARC 1979 PREPARATIONS

They (A Spectrum Planning Sub-Committee Working Group on the Amateur Services meeting in Washington since early 1974) have also proposed new amateur bands at 10.1-10.6 MHz, 18.1-18.6 MHz and 24.0-24.5 MHz. With communications satellites assuming more and more of the burden of long-distance commercial and government traffic, these enlarged HF amateur allocations are a distinct possibility. Editorial in July '74 Ham Radio. ●

A Digital Readout for Transceivers

ROY HARTKOPF, VK3AOH
34 Toolangi Road, Alphington, 3078

There are many advantages in using a digital readout, not least being the fact that it saves a lot of space around the critical front panel area and in addition it can be more accurate than the most expensive, elaborate and cumbersome dial mechanism. This article describes a 3 decade readout with 1 kHz resolution.

About a year ago Ron, VK3BDM and I started working on the design of a SSB transceiver. While looking for ideas, we came across the series of articles by Harold Hepburn and Ken Nisbet published in AR during 1968 and 1969. We decided to use the same type of VFO generator, namely a 10 to 10.5 MHz VFO mixed with a 46 MHz crystal to give an output of 56 to 56.5 MHz. There is no doubt that a high frequency VFO does help to reduce spurious responses in the receiver and those interested in the details should refer to the article in AR of December 1968.

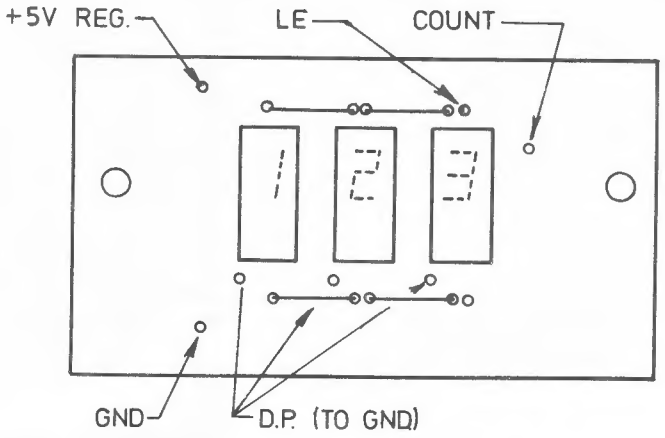


FIG. 2 DISPLAY BOARD (DISPLAY SIDE)

However, we had another reason for choosing this particular type of circuit. We had been playing with the idea of having a digital readout using a light emitting diode display instead of the normal dial. There were two important requirements; firstly that the circuit had to be relatively simple and compact and secondly that the cost should be reasonably low.

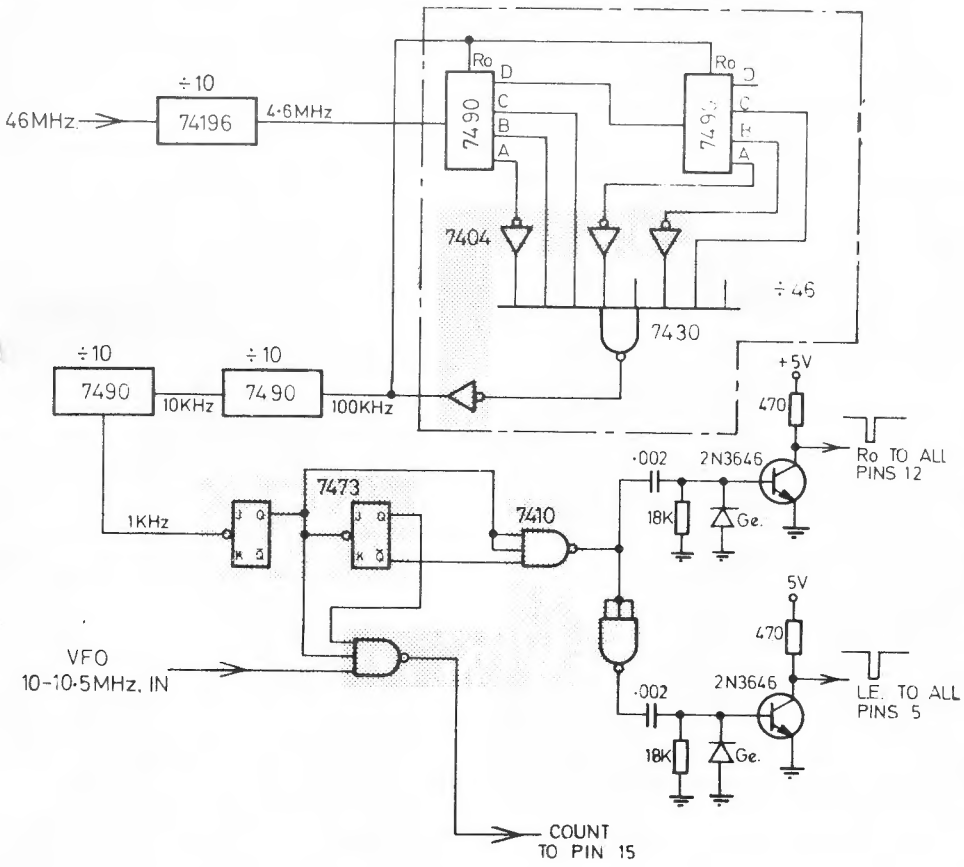


FIG. 1 CIRCUIT SCHEMATIC

Finally, as long as the crystal oscillator which provides the timing gate does not drift there is never any need to recalibrate because the readout measures the actual frequency and not the mechanical position of the tuning capacitor.

One of the problems in using a counting circuit is that, as mentioned above, there needs to be some accurate reference frequency which can be divided down to supply the timing gate. And, of course, any additional oscillator permanently running in a sensitive receiver is another possible source of trouble in the way of spurious responses. However, in the VFO arrangement mentioned above, the problem was already solved for there was the 46 MHz crystal oscillator already in the VFO generator and this was running permanently both on transmit and receive and would provide the necessary reference frequency.

The other requirement for any type of frequency counter is to have some frequency to count and here again this particular arrangement enabled the requirement to be solved very simply. The VFO oscillator goes from 10 MHz to 10.5 MHz and by having a three digit readout and a gating system which selects the display in kilocycles it was possible to have a readout which displayed the frequency in kilocycles regardless of which band happened to be in use. One simply looked at the reading on the band change switch and added the reading shown on the display. On the 3.5 MHz band of course one had to remember to add 3.5 MHz to the kilohertz reading. For instance a digital reading of 125 kilohertz has to be added

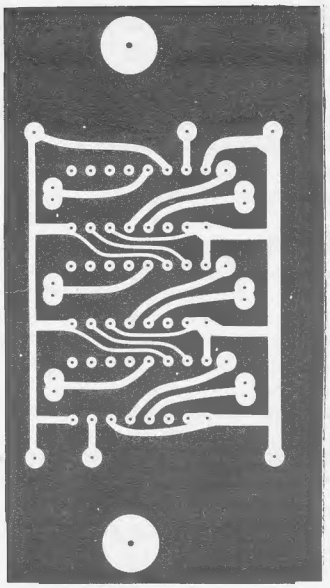
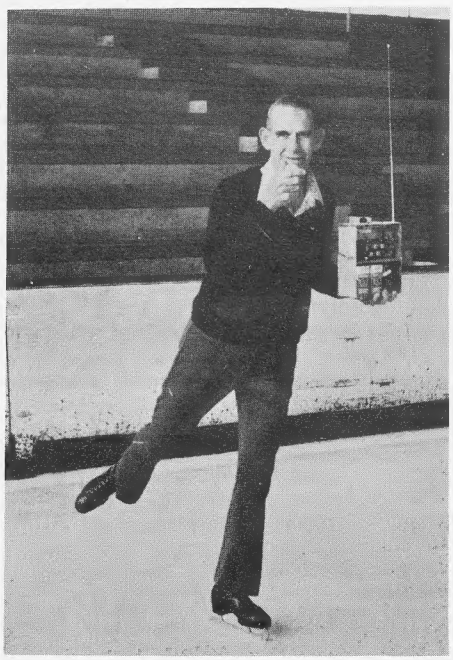


Fig. 3—Copper Copper side of display board (actual size).

not to 3 MHz but to 3.5 MHz, making the actual frequency 3.625 MHz. But on the 7, 14, 21, 27, 28 and 29 MHz bands the reading is directly as it is shown on the LED display.

For those who are interested the logic diagram is shown in Fig. 1. A high frequency decade counter SN 74196 is used in the first stage. This will nominally handle frequencies up to 50 MHz but in fact most of the ICs will go higher. Following this it is possible to use the slower speed (they still go up to 30 MHz or higher!) standard decade counters such as the 7490. These, together with the hex inverters 7404 and the 7430 which is an eight input NAND gate, make up a divide by 46 facility which brings the frequency down to 100 kilohertz. From there two more 7490s divide by a hundred to bring the frequency down to 1 kilohertz. Thus we arrive at the final timing frequency which operates the 7473 flip flop and the 7410 triple NAND gate which comprise the gating and reset system. The 1 kilocycle frequency is of course extremely stable. In fact, the crystal would have to shift by 46 kilohertz before the timing frequency shifted even one hertz. (A 46 kHz shift in the 46 MHz crystal would still produce a 9 kHz readout error.—Tech. Ed.)

Apart from the integrated circuits the only other components needed are a couple of transistors, capacitors and resistors for operating the reset and latch facilites of the LED display. Three leads, one for the count, one for the latch and one for the zero reset are the only signal connections between the main logic board and the display.



Roy, VK3AOH tries to save precious time by combining skating practice with amateur radio. Like most other projects the home brew two metre transceiver is still waiting on final modifications before completion.

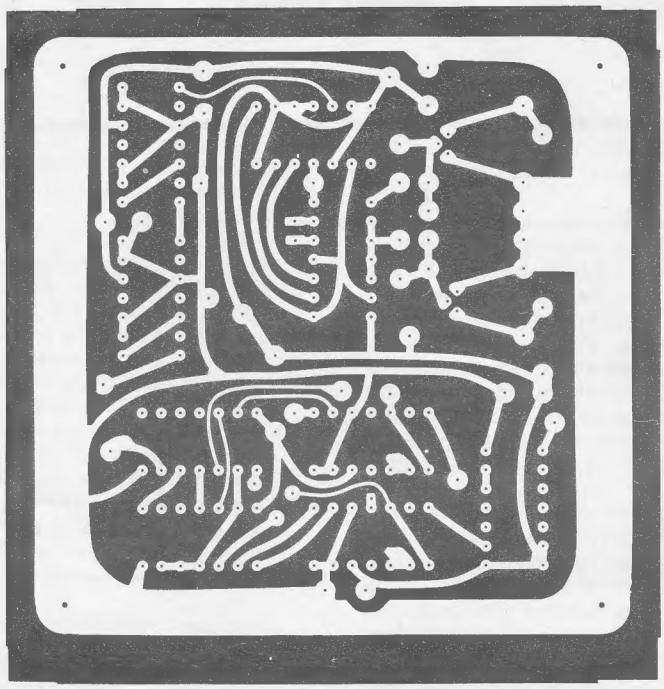


Fig. 4 —Copper side of main logic Board (actual size).

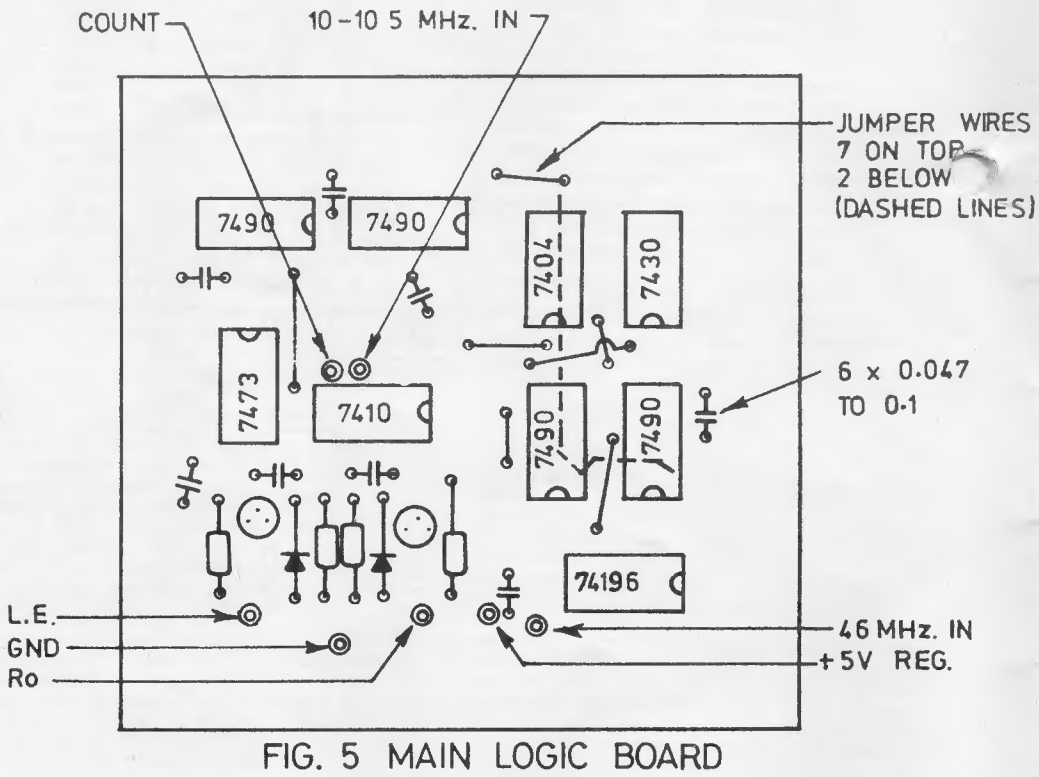


FIG. 5 MAIN LOGIC BOARD

The display itself uses three LED displays type TIL 306. These are slightly more costly than some other LED displays but they were chosen because they have built-in the complete counting logic including the counter, the latch, the decoder, and the limiting resistors for the LED display. The result is that the whole of the display system can be mounted on a board only 1½ inches wide by three inches long and this is mounted directly behind the front panel on two ⅛ inch screws. The main logic board already described is also quite small being 3¼ inches square.

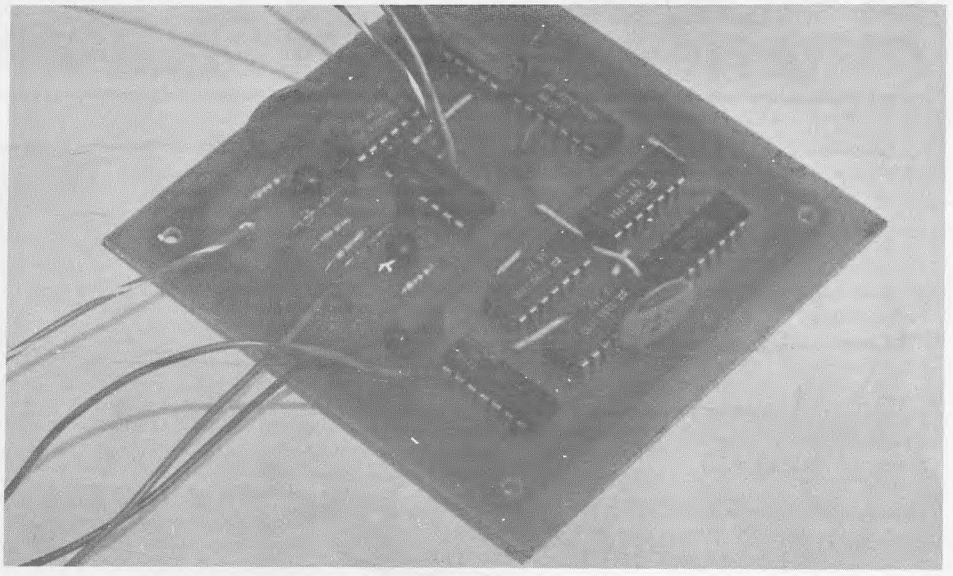
These two boards are shown full size in Figs. 2, 3 and 4 respectively.

Fig. 5 shows the component layout looking at the top of the main logic board and the position of the power leads and the signal leads shown in Fig. 1 are also identified. Also on this figure can be seen the jumper leads which are on the top of the board. In addition it is necessary to make two jumper connections on the underside of the board in order to join the output of one of the hex inverters, pin 6, to the Ro connection, pins 2 and 3, on each of the 7490s which are used in the divide by 46 section.

Apart from a regulated five volt power supply this is all that is needed to provide a digital readout for any transceiver using a VFO generator similar to the one described at the beginning of this article. The simplest way of getting a five volt regulated power supply is to use an LM 309K. The only other component needed is a 0.1 microfarad capacitor at the input to the IC. With a standard heatsink the LM 309K will supply up to 1 amp which is more than enough for both the logic and the display systems. The input to the LM 309K can be anything from about 7 to 20 volts. The higher this input voltage is the more power has to be dissipated by the IC so it is wise to keep the voltage fairly low, say not more than 10 to 12 volts.

In order to operate the logic satisfactorily the 46 MHz input and also the 10 to 10.5 MHz input should be fairly low impedance — about 500 ohms, and the voltage swing should be from about plus 4 volts to something under 0.5 volt in both cases. This voltage swing is fairly critical and under no circumstances should the voltage swing higher than 5 volts or lower than ground potential otherwise the IC and even more importantly, the LED display, could be damaged. This means that it is unwise to take the signal source from any kind of tuned circuit or from any buffer stage which has a rail voltage greater than 5 volts. In most cases a VHF transistor with a suitable resistor in the base, the emitter grounded and the collector connected to the 5 volt rail through a 470 ohm resistor will provide a suitable buffer stage. But this depends of course on the type of circuit which has been used for the 46 MHz oscillator and the VFO.

Both the TIL 306 and the TIL 307 are identical except for the fact that one has a right hand and the other a left hand decimal point. Since there is little purpose in using the decimal point in this application, the decimal point input pins (pins 13) should be grounded to suppress the decimal points and whichever of the LEDs which are most easily available can be used.

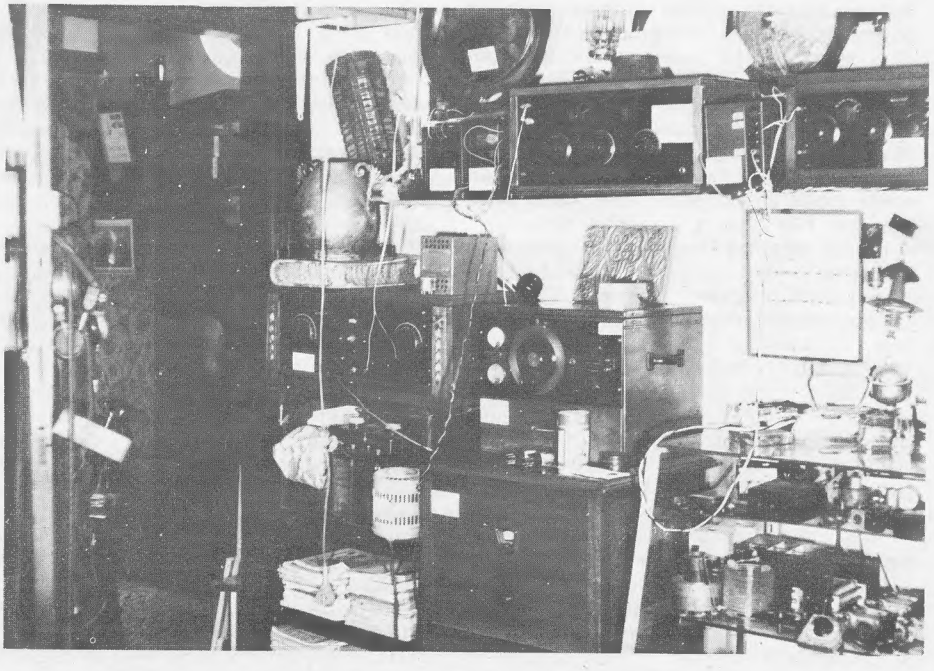


Top view of main logic board.

The digital readout has been in use for several months and has given excellent results. This, by the way, is in the transceiver constructed by Ron, VK3BDM. Apart from the digital logic boards and a few other bits and pieces the writer's own proposed transceiver hasn't even got off the ground.

Has anyone some spare time they would like to dispose of? Or maybe some unwanted 72-hour days?

NOTE—The VFO generator would normally be very carefully screened so that only the 56-56.5 MHz frequency would come out to the rest of the transceiver. The main logic board should also be mounted in this screened compartment. It has not been proved necessary to shield the LED display board. ●



Some of the magnificent old equipment at Burtoft's Amateur Wireless Museum in Links Ave., Concord, NSW. Inspection is by appointment only by telephoning Harold at 73 2369 (Priv.) or 92 0411 (Bus.). ●

An AR Special
A Review of the ICOM IC22

Over the next few months 'Amateur Radio' will be presenting a series of reviews on a selection of the latest two metre FM transceivers. In advance we would like to thank the various distributors of this gear who have made these reviews possible.

The Icom IC22 is distributed by Maico Electronics of Mount Street, Heidelberg, Victoria. It is one of a wide range of VHF transceivers produced by Icom. Details on all Icom equipment can be obtained from the company.

The IC22 is a fully solid state transceiver designed to operate over any two megahertz section of the two metre band. It employs 23 transistors, 3 FET's, 3 IC's and 16 diodes. There is provision for 22 channels which should take care of future requirements of most operators. As we will later see, the circuitry employs some very interesting features many of which are not to be found in other pieces of contemporary gear. It is also one of the smallest of the currently available FM transceivers measuring only 2-9/32" high, 6-1/8" wide and 8½" deep. The weight is 4 pounds. Construction throughout is in light-weight aluminium with a plastic front panel assembly.

Finish is in black with the metal sections in a fine wrinkle paint and the front panel in a dull non-reflecting surface with matching knobs. To offset this the meter is brightly illuminated with sharp red and green calibrations. The channel selector numbers come up in green, plus red and blue transmit and receive indicators. An excellent mobile mount with a quick release facility is supplied, as is a good quality dynamic microphone. All necessary mounting hardware is included with the set. Transmitter output is rated at ten watts with one watt in the low power position.

Power required is a nominal 13.5 volts DC, and current drain is specified at 2.1 amps on high power transmit, 1.2 amps on low power and receiver 180 mA average.

IC22 CIRCUIT DESCRIPTION

Now for a closer look at the inside layout and circuitry of the 'black box'. Both transmitter and receiver are constructed on a common printed board with the twenty two crystal channels and their associated trimmers mounted on a separate board. This of course amounts to forty-four actual crystal positions and trimmers.

The receiver is a double conversion superhet with the first IF at 10.7 MHz and the second IF at 455 kHz. Ceramic filters are employed at both IF frequencies to provide a high degree selectivity. A 3SK40 dual gate MOS FET is used as the receive RF amplifier followed with a 2SK37 FET as the first mixer. Between these two stages are five helical resonators to give a high rejection to strong out-of-band signals and to generally improve cross modulation characteristics. The 455 kHz IF stages use two transistors and one IC to provide a high degree of gain. An IC is also used as the complete audio output section. The receive indicator light glows when the mute is opened either with a signal or by operation of the mute control. With the audio control turned off, this light gives a visual indication of an incoming signal on the selected channel. Receiver frequency control is from a 15 MHz crystal multiplied by nine with two tripler stages. This is then mixed to give the first IF of 10.7 MHz. The DC supply to the receiver goes via an 8 volt series regulator.

One of the interesting features of the IC22 is the use of solid state switching. This is not only for the supply voltage switching but also for the antenna change over. For a while, you might miss hearing the usual snap of the relay as you push the transmit button.

The transmitter section is quite straight forward. Frequency control starts with an 18 MHz crystal oscillator, followed by one buffer stage, a diode phase modulator, then three doubler stages, two more buffers and the final stage. Audio for the transmitter is handled by one IC feeding from the 500 ohm dynamic microphone. The output of the IC feeds to the deviation control via a low pass filter. Between the deviation control and the output transformer is a deviation level selector. By shifting a flying lead connector from one connector post to the other, either wide or narrow deviation may be selected. This is in addition to the normal deviation control. Strangely, this adjustment does not rate a mention of any sort in the otherwise excellent instruction manual. Low power selection is accomplished by switching a 20 ohm 5 watt resistor in series with the supply voltage to the last buffer and the final stage. The front panel meter switches automatically from 'S' meter on receive to relative output meter on transmit.

THE IC22 ON THE AIR

The channel selector was difficult to read when the set was in place under a car dash board. There was also a considerable parallax error. To accurately determine which channel was selected, a straight-on view was needed.

This is due to the small size and close spacing of the channel numbers on the selector switch. Receiver audio quality appeared to be much better than is usual with transceivers of this size. This is no doubt due to the use of a 4 inch speaker mounted in bottom of the transceiver cabinet. Provision is also made to plug in an external speaker via a 3.5 mm phone jack at the rear of the cabinet. Actual audio output appeared to be on the low side for noisy situations. This was later confirmed when the audio output was measure Transmitted audio quality was clean and smooth, however, some reports indicated slightly on the bassy side. Deviation was set to the low position when the set arrived from the agents. This was changed to the high tapping and the deviation control reduced. This appeared to produce the best results.

Operation of the controls apart from the channel selector was excellent. The receive mute control operated with a smooth fading action as distinct from the sudden death action of many solid state sets. Audio gain could be left set at a normal point, with the power on/off switch separate and combined with the high/low power selector.

A useful feature of the IC22 is the ability to net the transmitter frequency to the receiver. After connecting a centre zero meter to the discriminator output which is available on the accessory socket at the rear of the cabinet, a jumper is connected

between two test points on the board. The transmit crystal trimmer is then adjusted for a zero reading on the meter. Obviously this only applies to simplex operation.

THE IC22 ON TEST

Transmitter output was measured with a Marconi RF power meter. With a 13 volts DC supply to the IC22, exactly 10 watts output was indicated in the high power position, and .8 watts in the low power position. The final and driver stages were trimmed but output could not be increased. The multiplier stages were not touched.

Receiver sensitvity was next checked using a Marconi FM signal generator. At .5uV, 27dB of quieting was measured with signal to noise ratio at the same input showing 30dB. These are excellent figures. With the mute control set at maximum sensitvity, the receiver opened up at a level of .5uV — 8dB. With the mute hard on, it took only .5uV + 2dB to open the receiver.

The 'S' meter was checked for calibration with the following results.

Meter Reading	Sig. Gen. Setting
0	.5uV
1	1.25uV
5	4.0uV
9	100.0uV

Above 9 on the scale, the increase flattened off with the 9 to 40dB over only showing an increase of 12dB.

Receiver audio power output was measured by feeding the output to a dummy load and measuring the voltage with a VTVM. At the onset of audible distortion, .5 watts was indicated. This is well below the specified 1.5 watts, however this could be due to the fact that steady tone was used in our test. With speech output, more power could possibly be delivered.

Receiver selectivity was measured with an input of .5uV. At this level, the receiver accepted +/— 7 kHz deviation with low distortion. It was noted though, that at lower inputs, the deviation acceptance decreased somewhat, so that many stations with normal modulation tended to sound slightly distorted. This is caused by the shape factor of the filter used in the 455 kHz IF strip. If required, a better filter can be easily substituted, as the printed board is drilled to accept the top quality Matura ceramic filter.

Current drain was checked with 13.0 volts applied to the set. With full output the receiver drain was 500 milliamps. In the muted off position the drain was 300 milliamps. This is a little higher than the specified 180 milliamps. High power transmit drain was spot on at 2.1 amps.

INSTRUCTION MANUAL

In general this is well written with only a very few omissions. Printed circuit board layouts are included, as is the circuit diagram and block layout.

Maintenance, including alignment details, is covered in three short paragraphs.

SERVICE FACILITIES

In view of the lack of service information supplied, it must be assumed that most owners will rely on the dealer to provide this. Maico Electronics are well qualified in this area. They hold comprehensive spares and also stocks of crystals for all the popular channels at very reasonable prices.

In conclusion, I would like to acknowledge the help of Peter Linden VK3BX in formulating test figures for the IC22.

VK3OM

SPECIFICATIONS

GENERAL:
Frequency coverage—144.00 to 146.00 MHz or 146.00 to 148.00 MHz.
Number of Transistors and Diodes—Transistors 23, FET 3, IC 3, Diodes 16
Modulation Type—F3
Power Voltage—DC 13.5V plus-minus 15% negative ground
Current Drain—Transmit: HI (10W) average 2.1A, LOW (1W) average 1.2A
Receive average—180mA
Antenna Input—50 ohms
Size 2-9/32" high x 6-1/8" wide x 8-1/2" depth
Weight—4 lbs.

TRANSMITTER:
RF Power Output—HI 10W, LOW 1W
Frequency Control—Crystal (18 MHz) multiplied x 8
Maximum Frequency Deviation—Adjustable between 3 to 16 kHz
Audio Input— 500 ohms.
Modulation System—Variable reactance phase modulation
Microphone—500 ohms — Dynamic microphone with push button switch

RECEIVER:
Reception Frequencies—22 channels for 2 meter band
Reception System—Double Superheterodyne
Intermediate Frequencies—1st intermediate: 10.7 MHz, 2nd intermediate: 455 kHz.
Sensitivity—a. Better than 0.4 uV 20 db quieting, b. S plus N/N at 1 uV input, 30 db or more
First IF—10.7 MHz
Second IF—455 kHz
Spurious Response—minus 60 db
Spurious Gain—minus 60 db, or less
Squelch—Adjustable 5 to minus 15 db
Band width—plus-minus 8 kHz/minus 6 db point, plus-minus 15 kHz/50 db
Audio Output Power—1.5W
Audio Output Impedance—8 ohms
Frequency Control—Crystal (14 MHz) multiplied x 9 ●

HIGH RISE ANTENNA

Eric W. Bierre VK2BEK
90 Wallis Street, Woollahra, N.S.W., 2025

Living in a large block of home units can certainly have problems for the Radio Amateur wishing to boost his signal with a beam antenna.

Eric VK2BEK, has solved this problem nicely. He resides in a 13 storey block of units in Elizabeth Bay, N.S.W., and was given permission by the owners to erect an antenna on the roof. The proviso being that the structure of the building was not interfered with, and no TVI was caused.

The photograph on the front cover and those attached show how this was done efficiently and at moderate cost.

He obtained from a plumber, a base supporting 'cross', into which 4 pipes are screwed at right angles. A flange was welded to the base to hold a 1½ inch diameter mast.

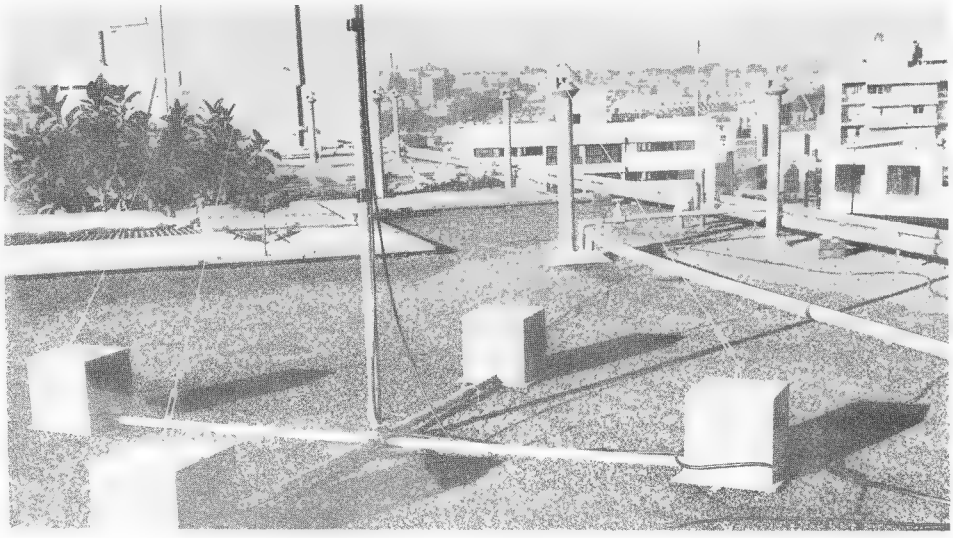
Into the cross were screwed 4 pieces of 1 inch (inside diameter) pipe 5 feet long. The vertical mast is 12 feet high including the rotator, and is screwed into the flange. Concrete blocks, each 1 cubic foot and weighing approximately 100 lbs. were made with a groove in one side to fit over the base pipes.

Guy wires are run from the concrete blocks to the rotator, and the whole assembly is extremely rigid. Eric is confident that the strongest winds in the area will not tip the antenna over.

The beam is a Hy-Gain TH3 Junior, and behind it can be seen an 18AVT which is used for 40 and 80 metres.

It all works very well, and thanks to a low pass filter and antenna tuning unit, there have been no complaints of TVI.

Eric suggests that other high rise home unit or flat dwellers could obtain permission for a similar structure. ●



Telecommand and Telemetry of the Oscar 6 and 7 Communications Satellites Part 3

David Hull, VK3ZDH
Project Australis

This is the concluding part of the 3 part series on the telecommand and telemetry of OSCARS 6 and 7. It deals with the telemetry systems.

TELEMETRY. MORSE CODE (OSCARS 6 & 7) RTTY (OSCAR 7)

1. MORSE CODE, TELEMETRY

This system of telemetry was developed for Oscar 6 and will be used as an alternative to the RTTY telemetry on Oscar 7. The design and development of these units has been covered extensively in published papers — see references — and will be summarised only. A Block diagram is shown in Figure 3.

The analog data to be transmitted is selected and converted to two decades of digital information. After analog to digital conversion the digital word is converted into morse code and used to key the earlier of the telemetry transmitter in the following format.

Sample frame of Morse Code Telemetry:

HI	180	191	159	160	
	296	286	295	251	
	363	373	369	336	
	437	428	437	435	
	536	520	530	544	
	618	600	643	650	HI

The morse letters HI identify the beginning and end of the telemetry frame and also serve as an official callsign (by permission of the FCC). The last two figures are converted to the appropriate calibration data by multiplying the decoded number by the channel factor. The data for Oscar 6 is shown in Fig. 4.

2. RTTY TELEMETRY

This system of telemetry was developed by Australis and will be flown in Oscar 8. The data will be transmitted at 45.5 baud with 850 Hz shift page print out and much higher data rate transmission has led to the expansion of the number of parameters covered. A block diagram of the system is shown in Fig. 6 with conversion tables shown in Fig. 7.

Each data word again begins with its channel

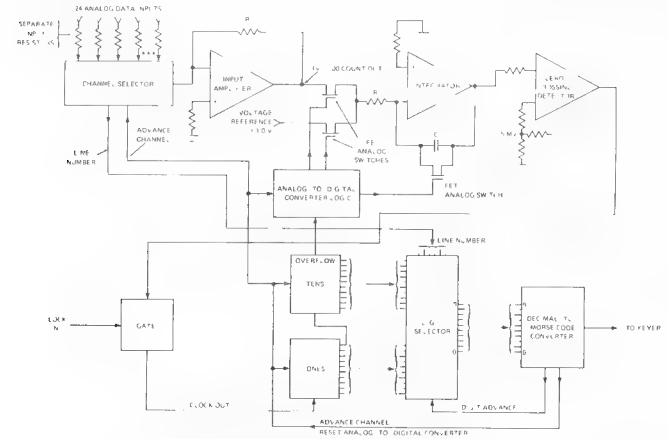


FIGURE 3 BLOCK DIAGRAM - MORSE CODE TELEMETRY ENCODER

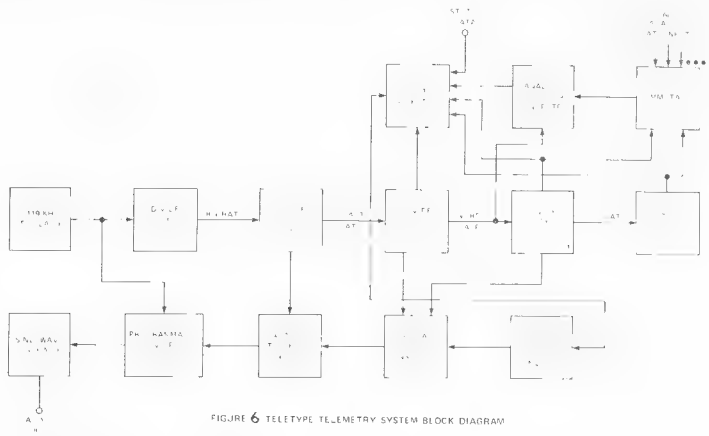
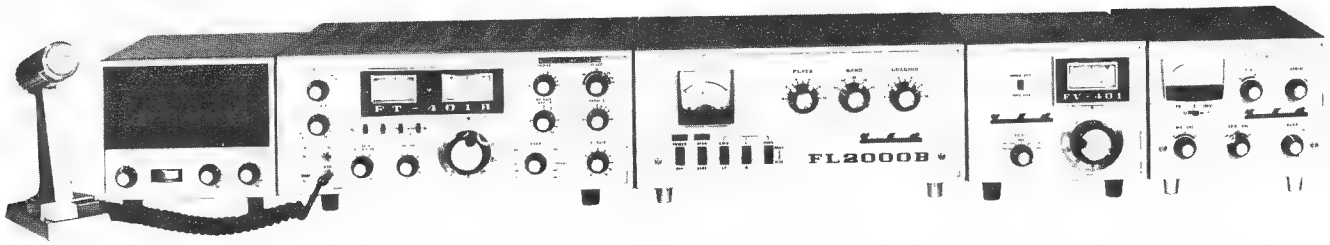


FIGURE 6 TELETYPE TELEMETRY SYSTEM BLOCK DIAGRAM

OSCAR DATA TO BE TELEMETERED BY THE MORSE CODE TELEMETRY SYSTEM

Chan.	Parameter	Unit	Parameter Range	Final Calibration Data/Comments N Value telemetered (omit first digit which identifies the data line number)	Transmitted Format (Read left to right)
1A	Total Array	I (ma)	0 to 500 ma.	I_T = 5.00 N (ma.)	1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 3C 3D 4A 4B 4C 4D 5A 5B 5C 5D 6A 6B 6C 6D
1B	+X Solar Panel	I (ma)	0 to 100 ma.	I_{+X} - 1.00 N (ma.)	
1C	-X Solar Panel	I (ma)	0 to 100 ma.	I_{-X} - 1.00 N (ma.)	
1D	+Y Solar Panel	I (ma)	0 to 200 ma.	I_{+Y} = 2.00 N (ma.)	
2A	-Y Solar Panel	I (ma)	0 to 194 ma.	I_{-Y} 1.94 N (ma.)	
2B	+Z Solar Panel	I (ma)	0 to 370 ma.	I_{+Z} - 3.72 N (ma.)	
2C	-Z Solar Panel	I (ma)	0 to 370 ma.	I_{-Z} 3.68 N (ma.)	
2D	Bat. Charge or Discharge	I (ma)	-500 to +500 ma.	I_{BAT} = 10.00 N -500 (ma.) Battery charge or discharge current	
3A	Unregulated Bus	V	12.4 to 30V	V_{BUS} = 0.174 N +12.4 (volts)	
3B	½ Battery	V	0 to 15V	$V_{\frac{1}{2}BAT}$ = 0.161 N (volts)	
3C	Switching Reg.	V	0 to 15V	V_{SR} = 0.147 N (volts)	
3D	Battery Temp.	^oC	-30 to +50°C	T_{BAT} = -1.471 N + 95.79 (^oC)	
4A	Baseplate Temp.	^oC	-30 to +50°C	T_{BP} = -1.471 N + 95.79 (^oC)	
4B	Transponder P.A. Temp.	^oC	-30 to +50°C	T_{PA} = -1.471 N + 95.79 (^oC)	
4C	+X Panel Temp.	^oC	-30 to +50°C	T_{+X} = -1.471 N + 95.79 (^oC)	
4D	+Y Panel Temp.	^oC	-30 to +50°C	T_{+Y} = -1.471 N + 95.79 (^oC)	
5A	+Z Panel Temp.	^oC	-30 to +50°C	T_{+Z} = -1.471 N + 95.79 (^oC)	
5B	Transp. P.A. Emitter	I (ma)	0 to 500 ma	I_{PA} = 5.00 N (ma)	
5C	Transp. Sw. Reg.	V	0 to 30V	$V_{T.S.R.}$ = 0.30 N (volts)	
5D	Instr. Sw. Reg.	I (ma)	3.8 to 63.8 ma	$I_{I.S.R.}$ - 0.601 N + 3.80 (ma)	
6A	Transponder R.F. Power	mW	0 to 10W	P_{OUT} = 1.0 $(N)^2$ (mW)	
6B	Beacon R.F. Power (435.1 MHz)	mW	0 to 1W	P_{OUT} = 0.10 $(N)^2$ (mW)	
6C	Transponder AGC	V	0 to 3V	V_{AGC} = 0.03 N (volts)	
6D	Midrange Cal.	V	0 to 1V	N = 50 counts ±1	

Figure 4 OSCAR 6 Morse code telemetry



FT-401 TRANSCEIVER: SSB, AM & CW, 80/10 Mx, PA two x 6KD6, 560 W peak input SSB. Full coverage on 10 Mx, WWV, two auxiliary (blank) ranges, PTT, VOX, RIT, Cal., fan, noise blanker, **$595.**

FT-101B TRANSCEIVER: 160/10mx, SSB, AM, CW, PA two x 6JS6C, 300w. peak input SSB. Built-in dual AC/DC power supply. Low current drain transistorised except for transmitter driver and PA. I.F. noise blanker, fan, FET receiver RF, clarifier, built-in speaker. Ideal for portable/mobile from 12v. DC, or in the shack on AC, **$598.**

FT-201 TRANSCEIVER: 80/10 Mx, similar basic features, power and appearance to FT-101B, at lower cost, 230 V AC **$498.**

FT-200 TRANSCEIVER: 80/10 mx, PA two x 6JS6C, 300w. peak input SSB. Manual, PTT or VOX control, offset tuning, calibrator. Operates from a separate power supply. **Real value at $351. FP-200:** Yaesu AC Power Supply for FT-200, in matching cabinet with in-built speaker, **$98.**

FT-75B TRANSCEIVER: SSB and CW. VXO, noise blanker, squelch. Very small size, transistorised, a superb little rig 80 W PEP. Microphone and five crystals included, **$268.**

FP-75B AC POWER SUPPLY: 230v., for FT-75B Built-in speaker, power cable and plug, **$68.**

DC-75B DC POWER SUPPLY: 12v., for FT-75B. Includes built-in speaker, mobile mount, power cable and plug, **$84.**

FL-101 TRANSMITTER: Solid state 160 - 10 m, PA two 6JS6C, all facilities. Companion unit to FR-101, **$498.**

FR-101D RECEIVER: All solid state, 23 bands inc. all amateur bands 160/10m plus 6 & 2m, FM, CW, etc, etc.! **$675.**

FR-101S RECEIVER: Economy version of FR-101D. Amateur bands only 160/10 Mx and less other options, **$530.**

FT-501 DIGITAL READ-OUT TRANSCEIVER: 80-10mx, SSB CW. 500w peak input, Includes 2-speed cooling fan, noise blanker, clarifier, VOX and etc. Inc. matching AC PS, **$850.**

FL-2000B LINEAR AMPLIFIER: 80-10 mx. Tubes, two x 572B triodes in G.G., twin fan cooled, **$429.**

FL-2100B LINEAR AMPLIFIER: Similar to FL-2000B but styled to match FT-101B, **$429.**

FT-620 SIX METRE SSB AM, CW, TRANSCEIVER: 10w solid state, **$395.**

S200R TWO METRE SYNTHESISED FM TRANSCEIVER: 200 channels, 10 W solid state. Simplex, repeater, reverse repeater & priority channel facilities, **$438.**

FTV-650 SIX METRE TRANSVERTER: Converts 28 MHz. SSB to VHF, and includes receiving converter. Primarily designed for coupling with Yaesu transmitters and transceivers, **$185.**

FT-224 TWO METRE FM TRANSCEIVER: 10 W, 23 channels, PLUS one priority channel. Includes B, 50, and four repeater channels, installed, **$259.**

FT-2AUTO FM TRANSCEIVER: Similar to FT-2FB but with addition of automatic scanning facility, etc., **$398.**

YC-355D FREQUENCY COUNTER: 200 MHz, **$335.**

YC-355: Similar to YC-355D but reads to 30 MHz, **$288.**

YO-100 MONITORSCOPE: Matches other Yaesu Equipment. Inc. IF for 3180 kHz. (IF kits for 455 kHz and 9 MHz optional extra), **$179.**

FF-50DX three-section LOW PASS FILTER for TVI reduction. **$24.**

MATCHING EXTERNAL SPEAKERS for FT-401, FT-101B, FT-201, FR-101, **$32.50.**

MATCHING VFOs: FV-401, FV-101B, FV-200, each **$120.** FV-50C (for FT-75B), **$65.00.**

YD-844 DESK MICROPHONE: Yaesu De Luxe PTT Dynamic type with stand. PTT switch, and PTT is actuated when lifted from deck, **$39.50.**

Hand-held PTT **DYNAMIC MICROPHONE, $18.50.**
VC-75 VOICE CONTROLLER: Speech compressor with VOX unit included. With lead and connectors to suit FT-75 and FT-620, **$58.00.**

As the sole authorised Yaesu agent for Australia, we provide pre-sales checking of sets, after-sales service, spares availability and 90 day warranty.
Quote type & S/N of set when ordering spares. All prices include sales tax. Freight is extra. Prices and specifications subject to change without notice.

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HF MONOBANDERS

HY GAIN

204BA, 4 element 20m. Beam ... **$180**
203BA, 3 element 20m. Beam ... **$168**
402BA, 2-element 40m. Beam ... **$159**

HF DUO BAND

DB-24B 4-element 20-40m Beam ... **$210**

HF TRIBAND BEAMS

HY GAIN

TH6DXX, 6-element trap Beam ... **$233**
TH3Mk3, 3-element trap Beam ... **$175**
TH3Jr, 3-element trap Beam ... **$118**
HY-QUAD 2-element Quad beam ... **$168**

HF VERTICALS

NEWTRONICS HUSTLER

Trap Vertical ... **$86**

HY GAIN

14AVQ, 10m. thru 40m. trap Vertical ... **$59.50**
18AVT, 10m. thru 80m. trap Vertical ... **$85**
12AVQ, 10m. thru 20m. trap Vertical ... **$43**
18V 10m. thru 80m. base loaded Vertical ... **$29.50**

HF MOBILE WHIPS AND FITTINGS

HY-GAIN 'HAM-CAT' SERIES

HMM, mobile mast assembly ... **$24**
MC Series coil and adjustable tip-rod assemblies:

MC-75, 80m	**$26**	MC-15, 15m	**$16.50**
MC-40, 40m	**$23**	MC-11, 11m	**$15.50**
MC-20, 20m	**$21.00**	MC-10, 10m	**$15.50**

YAESU

RS Series Gutter Mount HF Centre Loaded Mobile Antennas, consisting of gutter mounting base attachment and mast with 11'6" co-ax. and plug PL-259 attached (base mast doubles as a ¼ wave vertical on 2 Mx) and interchangeable coils with adjustable tip rods for 40 Mx to 10 Mx. 150 watt PEP, 4'6" total length. Slim and neat, brushed chrome finish, a typical **Yaesu** quality product. RS base and mast, **$19.50.** Coils RSL-7, **$19.50,** RSL-14, **$18.50,** RSL-21, **$21.50,** RSL-28, **$14.**

ASAHI

AS-303A HF Mobile Antenna set, centre loaded type 3.5-28 MHz, 400 W PEP, consists of common mast 4'6", telescoping to 2'6" for convenient stowage, five interchangeable loading coils with tip rods, and adjusting spanners inc., making a total height of approx. 7', with HD spring and ball mount. Beautifully engineered, feeds direct with 50 omh co-ax. The complete set a steal at **$100.**
AS-NK matching SS Bumper Mount Adapter, for AS303A. **$12.**

MARK MOBILE

Helical:

HW-160, 160m, 8ft.	**$48.00**	HW-15, 15m, 4ft.	**$20.00**
HW- 80, 80m, 6ft.	**$25.00**	HW-11, 11m, 4ft.	**$20.00**
HW- 40, 40m, 6ft.	**$23.50**	HW-11, 11m, 6ft.	**$21.50**
HW- 20, 20m, 6ft.	**$21.50**	HW-10, 10m, 4ft.	**$20.00**

FITTINGS: (Suit all makes).
BPR, bumper mount ... **$14**
BDYF, heavy duty adjustable body mount ... **$14**
HWM-1, fixed body mount ... **$13**
SPG, heavy duty spring ... **$11**
SPGM, light duty miniature spring ... **$6**
JMS "Jiffy" body mount ... **$10**
Asahi AS-KRB, flat roof mounting adapter for vertical trap antennas ... **$15**
C30-32 Ball Mount & Spring ... **$16**

VHF ANTENNAS

HY GAIN

23, 3-element 2m Beam ... **$16.50**
28, 8-element 2m Beam ... **$33.00**
215 15-element 2m super-beam ... **$64.00**
SGP-2, 2 m ground-plane ... **$15.00**
GPG-2, 2m ⅝ wave ground-plane ... **$27.50**
64B 4-element 6m beam ... **$41.50**
66B 6-element 6m beam ... **$65.00**

CUSH CRAFT

ARX-2K Extension kit, converts your old model AR-2 to three half wave vertical ... **$13.00**
ARX-2 New version of the AR-2 Ringo 2m three half wave 6dB gamma loop matched vertical ... **$36.00**
ARX-450, 435-450 MHz three half wave 6dB Ringo ... **$35.00**
AR-6, 6m ½ wave Ringo 3.75 dB ... **$33.00**
CR-1, 11m ½ wave Ringo 3.75 dB ... **$38.00**
A144-7, 7-element 2m Beam ... **$23.00**
A144-11, 11-element 2m Beam ... **$32.50**
A144-20T, 20-element 2m "Twist" Beam ... **$66.00**
A50-3, 3-element 6m Beam ... **$33.00**
A50-5, 5-element 6m Beam ... **$52.50**
A430-11, 11-element 430 MHz Beam ... **$23.00**

VHF MOBILE ANTENNAS

HY-GAIN

MAG-150, magnetic mount ¼-wave whip (108 thru 450 MHz) includes 18 ft. of RG58U and connector ... **$26.00**
270 Double stacked ⅝-wave fibreglass whip for 2m
W-102, 102" SS whip suitable 27-100 MHz ... **$15.50**
HMBA, telescoping mast for halo, and etc. ... **$13.50**

ASAHI

AS-2HR, ⅝-wave SS 2m gutter mount, inc. co-ax. ... **$32.00**
AS-2HRG, as above, but fibreglass whip ... **$34.00**
AS-2HRF ⅝-wave cowl mount type ... **$38.00**
AS-6RD 6m centre loaded SS whip, with gutter mount **$22.50**

NEWTRONICS

UHG-1, ¼-wave 2m gutter mount, inc. co-ax. ... **$17.50**

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BALUNS

A & R
25, 75 and 300 ohm, 400W ... **$19.50**

KW ELECTRONICS
KW Balun, 1:1, for 50 or 75 ohms, screw terminals, 1kW **$13.50**

HY GAIN
BN-86, broad-band ferrite Balun, 2 kW for Beams and Doublets ... **$24.00**
BN-27A as above especially for 11m CB band ... **$22.00**

ROTATORS

HY GAIN
333 Rotator, for the big beams and stacked arrays, 110 V AC ... **$280**

CDR
Ham II, 230 V AC ... **$175**
CD-44 Medium duty rotator, 230 V ... **$112**
AR-22L Light, low cost rotator, 230 V ... **$59**
Cable & Conductor for Ham II CD-44 ... **75 cents** yd.

ANTENNA ACCESSORIES

HY GAIN
LA-1, Lightning Arrestor, for installation in standard 52 or 72 co-axial feedline, designed to Mil. specs. ... **$39.00**
LA-2, smaller size co-ax arrestor ... **$8.75**
C1, Centre Insulator, for Doublets ... **$10.00**
421A, Power meter, 3-60 MHz, reads SWR, power on 10, 100 & 500 W scales, and AM modulation percentage. Especially made for Novice & Marine 11m use ... **$45.00**
476 TVI filter, attenuation begins at 41 MHz and is 25 dB down at 54 MHz, SO-239 connectors ... **$15.00**

Q CRAFT
Porcelain Egg Insulators ... **17 cents**
WIDE RANGE of Co-axial cable and connectors in stock.

KW ELECTRONICS
Multi-band dipole traps with ceramic "T" centre insulator, 80-10m bands per pair complete with insulator ... **$24.00**
Co-axial cable switch, 3 positions ... **$18.50**

B & W
Co-axial cable switches, 5 position, Model 550G ... **$24.00**

SWR METERS AND DUMMY LOADS

Q CRAFT
SWFS-2, single meter type, combined SWR and FS meter, 50 ohms, inc. FS pick-up whip, size 5" x 2" x 2¼". 3-150 MHz UHF connectors ... **$15.00**
SWR-2, dual meters, 50 ohms. Simultaneous reading of forward and reflected power, 5" x 2" x 2¼". 3-150 MHz UHF connectors ... **$22.00**

OSKER
SWR-200 large dual meters, switched 50-75 ohms, with calibration chart for direct power readings to 2 kW in three ranges. A very elegant instrument. 7⅝" x 2¾" x 3¾" ... **$42.00**

KW ELECTRONICS
Z Match Antenna Couplers, 80 metres to 10 metres. Beautifully finished in communication grey (see review "QST" July, 1972):—

KW E-Zee Match, screw terminals at rear, size 5½" x 6" x 12" ... **$64.50**

KW-107 Supermatch, as above but with addition of SWR meter, power meter with large 50 ohm dummy load to read up to 1 kW PEP, UHF sockets at rear. A superb piece of equipment, 7" x 8" x 13" ... **$178**
KW-160 "L" network single wire or co-ax. feed coupler especially for 160m. Also usable on 80 & 40 ... **$52.80**
KW-103 SWR Power Meter uses toroidal coil pick-up for continuous operation 52 ohms 1 kW max. to 30 MHz SO239 UHF sockets ... **$45.00**
KW Dummy Load 52 ohm Air Cooled. Will handle up to 1 kW (ideal for use in the workshop or field) ... **$29.00**
HEATH KIT
HN31 Cantenna Kit 1 kW oil cooled (oil not included) **$26.00**
HY GAIN
580. A 5 watt dummy load mounted in a PL-259 connector ... **$2.25**

OTHER ACCESSORIES

KATSUMI
AT-3 RF actuated CW Monitor and **Code Practice** Audio Osc. uses 4 transistors, 2 diodes, with built-in speaker and tone control.
Requires one UM3 penlite cell. In grey metal case, 2" x 3¼" x 3½" ... **$16.00**
EKM-1 Audio Morse CP Osc with speaker, one transistor. Headphone socket and tone control, requires one UM3 cell, in black metal case 3¼" x 3¼" x 1⅝" ... **$8.50**
AT-8 Audio Osc, larger de luxe type CP Audio Osc., 3 transistors. Includes relay for transmitter keying if required, and headphone socket. Tone and volume controls. Plenty of volume, suitable for group practice or tests. Nicely finished brown metal cabinet, 3¼" x 5" x 5". Requires four UM3 cells ... **$30.00**
MC-701 Mic. Compressor, battery operated. Available with 4 pin or TRS mic. connector, improved model **$45.00**
KW
Monitorscope Model KW108 uses 3" square face CRO tube, includes built-in 2 tone test oscillator, sweep generator and AC power supply. Convenient co-ax connectors at rear. A must for the proper adjustment and continuous monitoring to keep your SSB equipment operating at its maximum efficiency ... **$245**

MORSE KEYS

KATSUMI
MK-1 light weight Morse Key suitable for practice or transmitter use ... **$1.50**
EK-108 Electronic keyer, super quality, IC with dot memory. Built-in monitor & paddle. Solid state "relay". 230 V AC & 12 V DC types ... **$69.50**
HI-MOUND
HK-701 De luxe heavy duty morse key. Heavy base. A really beautifully constructed and finished unit. Fitted with a dust cover, standard knob and knob plate ... **$20.00**
MK-701 Side Swiper key to actuate Electronic keyer **$24.50**
BK-100 (BUG) Semi-automatic bug key, full adjustable **$29.50**

Also available: Equipment for novice, CB and Marine use on 11m band. Antennas, beams, Walkie Talkies, base stations, and accessories. Digital clocks, Barlow-Wadley receivers, Digital Clock BC/FM radios, Automatic VHF/UHF scanning receivers, SSTV, Generator noise filters.

Servicing facilities for all types of Amateur and Novice equipment. We check all sets before sale and provide a 90 day warranty.

All prices incl. S.T. Postage and freight extra. Prices and specifications subject to change without notice. Availability depends on stock position at time of ordering.

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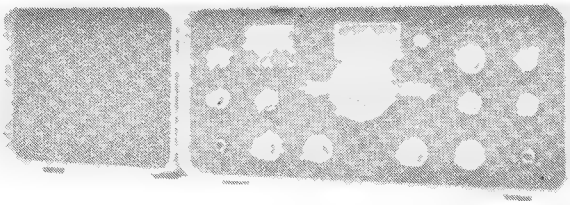
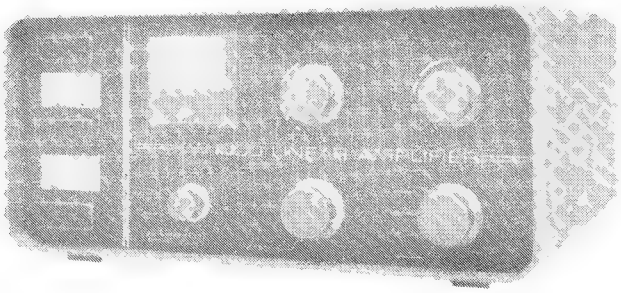
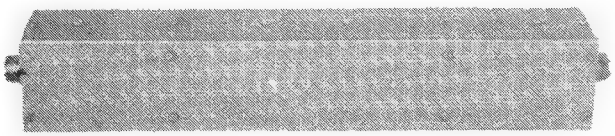


KW2000E 160-10m SSB-CW transceiver, 180 W, PA 2 x 6146. Mechanical filter, Calibrator, VOX, PTT, IRT/ITT/IRTT, ALC. Beautiful construction and appearance, excellent audio quality. Price, incl. PS **$635.00**

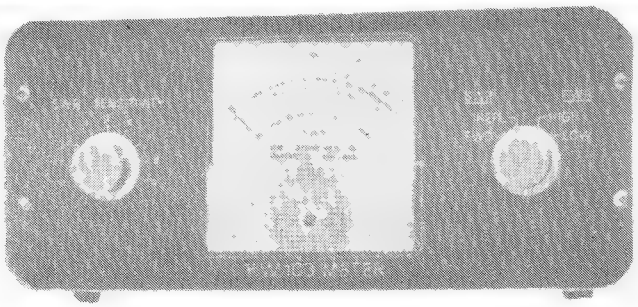


KW1000 Linear Amplifier, 80-10m, 2 x 572B/T160L in GG circuit. Fan cooled. Panel meter indicates plate volts, current, and SWR. Matches KW equipment, and is compatible with other equipment. **$449**

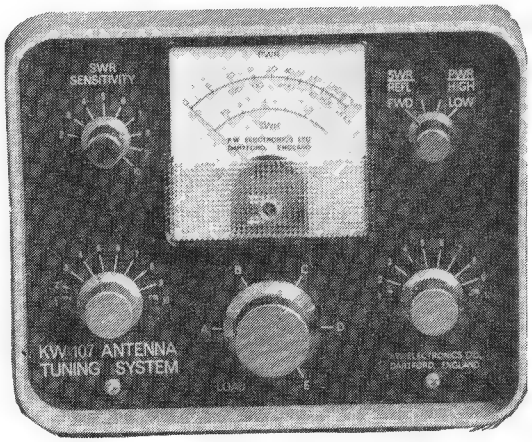
KW-108 MONITORSCOPE, connects in antenna line for visually monitoring your transmission. Includes built-in two tone oscillator. **$245**



KW LOW PASS FILTER, for TVI reduction. A very effective 5 section filter, with attenuation in excess of 80 db. Fitted with SO-239 UHF sockets. **$29.50**



KW-103 SWR/power meter, toroidal pick-up type for accuracy and reliability, 0-30 MHz. A quality unit. **$45**



KW-107 SUPERMATCH, an all in one unit, combines an E-ZEE match, Antenna switch, Dummy Load and SWR/PWR meter for balanced or coaxial feeds. Wide impedance matching range at up to IKW PEP.

KW ANTENNA Switch, 3 position co-ax switch with UHF type teflon connectors, usable up to 500 MHz, 1 KW PEP, cross-talk better than —80db. **$18.50**

KW E-ZEE MATCH, an efficient coupling unit of the Z mat type for use from 80 to 10 metres over a wide impedanc range. For use with balanced or coaxial feed lines. **$64.50**

KW MULTIBAND antenna traps. Comprises two special trap coils, ceramic centre "T" insulator and instructions for a 108 ft. 80-10m dipole, using co-ax or twin 70 ohm feeder. **$24**

KW-160, an "L" network coupler especially for 160m, can also be used right through 80 & 40 for single wire or co-ax feed. Similar size and appearance to the E-ZEE. **$52.80**

KW BALUN, 1 : 1, for 50 or 75 ohms, screw terminals, 1 KW. Ideal for dipole use, lightweight & waterproof. **$13.50**

KW DUMMY LOAD, air cooled, up to 1 KW, 0-70 MHz, 52 and 75 ohm. **$29.00**

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Figure 7. AMSAT-OSCAR 7 TELETYPE TELEMETRY SYSTEM

Channel No. XX Measurement 123

Channel	Measured Parameter	Measurement Range	Preliminary Calibration Equation.
00	PA Temp. - 70/2 Rptr.	-30° to +50°C.	T_2 = 95.79 - 0.1471 N (°C.)
01	+X Solar Panel Current	0 to 2000 ma.	I_{+x} = 2000 - 2 N (ma.)
02	+Y Solar Panel Current	0 to 2000 ma.	I_{+y} = 2000 - 2 N (ma.)
03	-X Solar Panel Current	0 to 2000 ma.	I_{-x} = 2000 - 2 N (ma.)
04	-Y Solar Panel Current	0 to 2000 ma.	I_{-y} = 2000 - 2 N (ma.)
05	+Z Axis Orientation	0 to 90°	θ_z = arccos (N/N_{max})(deg.from Zaxis
06	+X Solar Panel Current	0 to 2000°	I_{+x} = 2000 - 2 N (ma.)
07	+Y Solar Panel Current	0 to 2000 ma.	I_{+y} = 2000 - 2 N (ma.)
08	-X Solar Panel Current	0 to 2000 ma.	I_{-x} = 2000 - 2 N (ma.)
09	-Y Solar Panel Current	0 to 2000 ma.	I_{-y} = 2000 - 2 N (ma.)
10	-Z Axis Orientation	0 to 90°	θ_{-z} = arccos(N/N_{max})(deg.fromZaxis)
11	Battery Voltage	6.4 to 16.4 V.	V_B = 0.01 N + 6.4 (volts)
12	Half-Battery Voltage	0 to 10 V.	$V_{\frac{1}{2}B}$ = 0.01N (volts)
13	28V. Regular Voltage	0 to 34 V.	V_{28} = 0.034 N (volts)
14	10V. Regulator Voltage	0 to 15 V.	V_{10} = 0.015 N (volts)
15	9V. Regulator Voltage	0 to 10 V.	V_9 = 0.01 N (volts)
16	Bat. Charge Reg. #1 Vtge.	0 to 10 V.	V_{cr1} = 0.01 N (volts)
17	Bat. Charge Reg. #2 Vtge.	0 to 10 V.	V_{cr2} = 0.01 N (volts)
18	Ground-Zero Telemetry Cal.	0 V	V_o = 0.00 (volts); N=0± 1 count
19	Total Solar Panel Current	0 to 3000 ma.	I_T = 3 N (ma.)
20	Bat. Charge-Discharge Curr.	-2000 to +2000 ma.	I_B = 4 N - 2000 (ma.)
21	+X Solar Panel Current	0 to 2000 ma.	I_{+x} = 2000 - 2 n (ma.)
22	+Y Solar Panel Current	0 to 2000 ma.	I_{+y} = 2000 - 2 N (ma.)
23	-X Solar Panel Current	0 to 2000 ma.	I_{-x} = 2000 - 2 N (ma.)
24	-Y Solar Panel Current	0 to 2000 ma.	I_{-y} = 2000 - 2 N (ma.)
25	+Z Axis Orientation	0 to 90°	θ_{+z} = arccos(N/N_{max})(deg.fromZaxis)
26	+X Solar Panel Current	0 to 2000 ma.	I_{+x} = 2000 - 2 N (ma.)
27	+Y Solar Panel Current	0 to 2000 ma.	I_{+y} = 2000 - 2 N (ma.)
28	-X Solar Panel Current	0 to 2000 ma.	I_{-x} = 2000 - 2 N (ma.)
29	-Y Solar Panel Current	0 to 2000 ma.	I_{-y} = 2000 - 2 N (ma.)
30	-Z Axis Orientation	0 to 90°	θ = arccos (N/N_{amx})(deg.fromZaxis)
31	RF Pwr. Out - 2/10 Rptr.	0 to 10,000 mw.	$P_{2/10}$= (N/10)^2 (Milliwatts)
32	RF Pwr. Out - 70/2 Rptr.	0 to 14 watts	$P_{70/2}$= 14 (1-0.001 N)^2 (watts)
33	RF Pwr. Out - 435 Beacon	0 to 1000 mw.	P_{435} = 0.001 N^2 (milliwatts)
34	RF Pwr. Out - 2304 Beacon	0 to 1000 mw.	P_{2304} = 0.001 N^2 (milliwatts)
35	Battery Temperature	-30° to +50°C.	T_{Bat} = 95.79 - 0.1471 N (°C)
36	Baseplate Temperature	-30° to +50°C.	T_{bp} = 95.79 - 0.1471 N (°C)
37	+X Facet Temperature	-30° to +50°C.	T_{+x} = 95.79 - 0.1471 N (°C)
38	+Z Facet Temperature	-30° to +50°C.	T_{+z} = 95.79 - 0.1471 N (°C)
39	2304 Beacon Temperature	-30° to +50° C.	T_{2304} = 95.79 - 0.1471 N (°C)
40	Midrange Telemetry Calibr.	2.500 ± 0.001 V.	N = 500 ± 1 counts
41	+X Solar Panel Current	0 to 2000 ma.	I_{+x} = 2000 - 2 N (ma.)
42	+Y Solar Panel Current	0 to 2000 ma.	I_{+y} = 2000 - 2 N (ma.)
43	-X Solar Panel Current	0 to 2000 ma.	I_{-x} = 2000 - 2 N (ma.)
44	-Y Solar Panel Current	0 to 2000 ma.	I_{-y} = 2000 - 2 N (ma.)
45	+Z Axis Orientation	0 to 90°	θ_{+z} = arccos (N/N_{max})(deg.fromZaxis)
46	+X Solar Panel Current	0 to 2000 ma.	I_{+x} = 2000 - 2 N (ma.)
47	+Y Solar Panel Current	0 to 2000 ma.	I_{+y} = 2000 - 2 N (ma.)
48	-X Solar Panel Current	0 to 2000 ma.	I_{-x} = 2000 - 2 N (ma.)
49	-Y Solar Panel Current	0 to 2000 ma.	I_{-y} = 2000 - 2 N (ma.O
50	-Z Axis Orientation	0 to 90°	θ_{-z} = arccos (N/N_{max})(deg.fromZaxis)
51	Battery Voltage	6.4 to 16.4 V.	V_B = 0.01 N + 6.4 (volts)
52	Half-Battery Voltage	0 to 10 V.	$V_{\frac{1}{2}B}$ = 0.01 N (volts)
53	AGC Level - 2/10 Rptr.	0 to 27 dB	AGC = 10 $\log_{10}$ (N - 500)(dB)
54	TX Osc. Test Pt.-70/2 Rptr.	0 to 100%	TX = 0.10 N (percent)
55	RX Osc. Test Pt.-70/2 Rptr.	0 to 100%	RX = 0.10 N (percent)
56	Modulator Out. - 70/2 Rptr.	0 to 10 V.	MOD = 0.01 N (volts)
57	Envelope Test Pt.-70/2 Rptr.	0 to 10 V.	ENV. = 0.01 N (volts)
58	AGC Level - 2/10 Rptr.	0 to 27 dB	AGC = 10 $\log_{10}$(N - 500) (dB)
59	CONV Osc. Test Pt. - 70/2 Rptr.	0 to 10 V.	CONV = 0.01 N (volts)

number followed by the measurement. The frame begins with two identical lines of status information about the satellite sub systems and includes an indication of the last command received by the satellite. This is used to verify command acceptance and as a cross check for other command stations. In addition to the continuous page style of printout the encoder will continuously telemeter any one channel and may be stepped from one channel to the next. These functions are available upon command.

SUMMARY:
The successful command of Radio Satellites by amateurs was first demonstrated with the Australis built Oscar 5. Oscar 6 has already exceeded its design life by 50 per cent and this is due in no small part to the success of the command network, the command system and to the ability to monitor the satellite sub-systems through the telemetry read outs. The author would like to acknowledge and thank Mr. Larry Kayser VE3QB and Dr. Perry Klein K3JTE of AMSAT for permission to quote part of their papers on command and telemetry. Thanks are also due to Mr. Robert Wills VK3SF, the Melbourne University Autronautical Society and the Astronautical Society of Australia for computer times and programmes, and Mr. John Nott, VK3ZQN for help with Radio frequency and Antenna hardware. ●

REFERENCES:

(1) "SMART-SYSTEM MULTIPLYING AMATEUR RADIO TELECOMMANDS". By L. Kayser VE3QB. Presented to the ARRL Technical symposium on Space Communications Reston, Virginia, USA, September, 1973.
(2) "Spacecraft Telemetry Systems for the developing Nations". By P. Klein, J. Goode, P. Hammer and D. Bellair. Presented to the IREE National Telemetering conference, April, 1971.

OVERSEAS PUBLICATIONS SUBSCRIPTIONS

- Inflation and new exchange rates. "Rapid inflation", says the editorial in QST for Sept. '74, "the past couple of years has had a severe impact on ARRL's budget".
- The following are the latest 1975 subscription rates which supersede all previous advices (including that on p.25 of October AR) —

$A	1 year	2 years	3 years
Ham Radio	6.25	10.50	15.00
CQ*	6.50	11.00	14.50
QST	8.50	17.00	25.50
Break-In*	4.20	—	—
73	7.00	—	13.50
Radio Communication†	8.80	—	—
VHF Communications*	4.00 — Surface 6.20 — Air Mail		
CQ-TV	2.35	—	—

*Present rates.
†Please ask for membership form.

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Commercial Kinks

with Ron Fisher VK3OM

3 Fairview Ave., Glen Waverley, 3150

INCREASED OUTPUT FOR THE FT200

Dave Smithdale VK6DX reports on a simple modification on the final of the FT200 to increase output particularly on the higher bands.

"Anyone who has an FT200 should give away that nasty wirewound shunt in the cathode of the finals, and replace it with a good carbon resistor. The results are amazing, I am getting 125 watts out into a dummy load on 28 MHz after this modification. Prior to this the maximum was about 80 watts. The original shunt varies considerably with temperature".

It is also possible that the wirewound shunt has a fair degree of inductance putting the final cathodes well above earth. Whatever, Dave's modification appears to be very worth while.

METER ACTION ON THE FT200

Some time ago in this column, it was suggested that the meter action on the FT200 could be slowed down to give more accurate 'S' readings. K. Moore VK4IJ takes this one stage further.

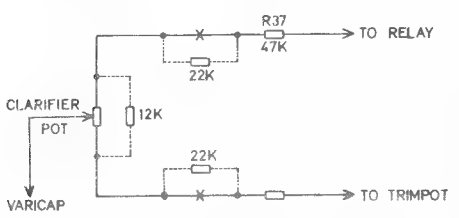
"A previous article in AR suggested a 1000 Mfd. capacitor across the S meter. I tried this and while it was a great improvement on receive, I did not like the action on transmit and felt it was not showing the true plate current peaks.

Examination of the remote VFO switch showed an unused bank of contacts, so one of these was used to switch the 1000 Mfd. capacitor in and out circuit. This switch is rendered inoperative by the blank accessory plug at the rear of the chassis when the remote VFO is not being used. Now I operate with the 1000 Mfd. normally out of circuit and switch it in when I need to give signal reports".

CLARIFIER ACTION ON THE FT200

Another one from K. Moore VK4IJ. This time he suggests that the clarifier covers too wide a frequency range and that the tuning can be made less critical with a few simple modifications.

"The clarifier on my FT200 was as critical to set as the main tuning and covered an unnecessarily wide range for my purpose. The following modification was carried out.



This leaves the total resistance of the network unchanged and gives a much smoother action to the control. It now covers about 1/5th of its previous range. ●

Try This

with Ron Cook VK3AFW

and Bill Rice VK3ABP

SUBSTITUTE ALIGNING TOOL

In an emergency the pointed clip from a ball-point pen can be used for turning slugs in Neosid formers. Being plastic they do not damage the slugs. If the tapering portion is trimmed off the clip will reach to the bottom of the Neosid former. (Only pens branded "Bic" appear to have this type of clip.—Ed.)

BACKLIGHTING PRINTED CIRCUIT BOARDS

An aid for checking the wiring of printed circuit boards from the component side is to use a back light from a 35 mm slide viewer. This is an even light and will shine through the p.c. board enabling component placement to be checked with the copper configuration.

TOOTHPASTE TUBE KNOBS

The white caps from toothpaste tubes make an inexpensive source of control knobs particularly for miniature gear. The centres can be partially filled with Araldite so that when set, a flat is provided for a corresponding flat filed down on the spindle for a push on fit. Alternatively the caps can be tapped for a grub screw. (Or a metal tube insert may be cemented in.—Ed.)

Don Gilder VK3AHG ●

Newcomers Notebook

with Rodney Champness VK3UG

44 Ratnmullen Rd., Boronia, Vic., 3155

It is nearly Christmas again, time to review activities for the year, and to plan for the forthcoming year 1975. This may well be the year that Novice Amateur Radio Operators start to make their appearance on the bands.

Whether you be an associate of the WIA, or a full member, the advent of Novice licensing will affect you in some way or another. As an associate who perhaps feels that he or she isn't up to the standard of the full licence the Novice licence may be just what you have been waiting for. There will no doubt be problems that will need to be ironed out as the Novice licence is introduced. Regretably, there will be some full call amateurs who will resent the new Novice and will make life hard for the Novice by deliberately interfering with his QSOs and-or refuse to operate with him. Fortunately there will be others ready and willing to assist the Novice operator. I would like to point out that the licence as it has been proposed is for two year tenure only, so you will need to up-grade to the full or limited ticket within two years. I would suggest that any Novice should concentrate the majority of his operating on CW to get his morse speed up for the 10 wpm exam. CW is an excellent DX mode of operation; ideal considering the power proposed for Novice use.

I am hoping this coming year that I will have sufficient time to build a Novice style 80 metre transceiver suitable for CW or AM-CW use. I anticipate describing as completely as possible how each section works and presenting it as a workable project.

An additional club in Melbourne has started tuitional classes for aspiring amateur radio operators. This is the **Eastern and Mountains District Radio Club, P.O. Box 87, Mitcham, 3132.** Have other States got clubs who are running tuitional classes for aspiring amateurs? If so why not let me know so that it can be published.

Thought for the New Year — support the WIA, help it to improve amateur radio. If you think that the WIA is not doing things the way it should, don't just criticise, get into it and try to improve things — there are too few who help. Merry Christmas and a Happy New Year. ●

Magazine Index

With Syd Clark, VK3ASC

SHORT-WAVE MAGAZINE July 1974

Rejuvenating the AR88 Receiver; Cubical Quad for Two Metres; Low Voltage PSU.

QST August 1974

An Active Mixer-Converter for 1296 MHz; Remote Control for the Morse Code Time Identifier; New Symbology for Digital-Logic Diagrams; A Quasi-Logarithmic Analog Amplifier Limiter with Frequency-Domain Processing; Learning to Work with Semiconductors; The Helirope Winder; Making Two-Sided Circuit Boards by the Photo-etching Process; Independent 8-Channel Frequency Selection with only Three Wires; A Remote Antenna Switch; Amateur Radio SELF Monitoring.

September 1974

A Simple 146 MHz Antenna for Oscar Ground Stations; An Experimental Frequency Standard Using ICs; Additional Frequency Ranges for the Colli 75S-3; Phase-Locked Tuning in a Two-Metre Re ceiver; Off-Centre-Loaded Dipole Antennas; Learning to Work with Semiconductors, Part VI.

73 MAGAZINE August 1973

Directional Wattmeters and Novel SWR Meter; FETS on 450 MHz; GDO to find C; Super Trimline for 2; R390A Modifications for Improved Performance; R-392 on the Air; Super Selective CW Tracking Filter; An Audible Voltmeter; Midland 2M Base or Portable; Cheap and Easy 230 V AC Power Supply; Universal Power Supply; Review of Grounded Cathode Linears; Slide Rule Rules; SSTV Scan Converter; House Cleaning the Logical Way; ID Timer; Fail Safe Switching Improved.

HAM RADIO July 1974

Narrow-band Solid State 2304 MHz Pre-amplifiers; R390A Product Detector; Miniature 7 MHz Transceiver; Camera Converter; Autopatch Design; 5/8 Wavelength Antennas for Two Metres; VHF Radio Observatory; Customs Enclosures; Solar Power Supplies.

CQ July 1974

An Accurate Solid State Component Curve Tracer; QRP Commercial Gear Parts Sources; Antennas for Problem Areas; 1973 World Wide DX Contest; Phone Results.

August 1974

The Transistor in 1926?; CQ Reviews the Robot Research SSTV Line; Indoor Antennas; 1973 CQ World Wide DX Contest; CW Results. ●

VHF UHF
an expanding world
with Eric Jamieson VK5LP

Forreston S.A. 5233
Times GMT

DECEMBER 1974

AMATEUR BAND BEACONS

VK0	VK0RSA, Macquarie Island	52.160
	VK0MA, Mawson	53.100
	VK0GR, Casey	53.200
VK1	VK1RTA, Canberra	144.475
VK2	VK2WI, Sydney	52.450
	VK2WI, Sydney x	144.010
VK3	VK3RTG, Vermont	144.700
VK4	VK4RTL, Townsville	52.600
	VK4WI/1, Mt. Mowbullan	144.400
VK5	VK5VF, Mt. Lofty	53.000
	VK5VF, Mt. Lofty	144.800
VK6	VK6RTV, Perth x	52.300
	VK6RTU, Kalgoorlie	52.350
	VK6RTT, Carnarvon	52.900
	VK6RTW, Albany	144.500
	VK6VF, Perth	145.000
VK7	VK7RTX, Devonport	144.900
VK8	VK8VF, Darwin	52.200
P29	P29GA, Lae, Niugini	52.150
3D	3D3AA, Suva, Fiji	52.500
ZL1	ZL1VHF, Auckland	145.100
	ZL1VHW, Waikato	145.150
ZL2	ZL2VHF, Wellington	145.200
	ZL2VHP, Palmerston North	145.250
ZL3	ZL3VHF, Christchurch	145.300
ZL4	ZL4VHF, Dunedin	145.400

x denotes a change from last month

Some changes to beacon listing this month. Firstly, I have had a communication at long last from Sydney, through Roger VK2ZRH, of the correct frequency of the VK2WI 2 metre beacon. Roger also advises awaiting news from the PMG Dept. regarding 432 and 1296 MHz beacons.

The Perth beacons will be using their new call sign VK6RTV, and comprehensive testing carried out on them shows the 6 metre beacon to run about 17 watts output with low pass filter in place, and the 2 metre beacon 9 watts out. These beacons are listed as it seems likely they will be operating in time for the end of the year DX. Thanks to the VK6 VHF Group News Bulletin for the above info.

The final change concerns JA1IGY in Tokyo. It appears there is just not enough operating room in the six metre band in Japan to be able to accommodate a beacon, not even 3 kHz! So JA1IGY is off the air until further notice. I suppose one could say with that type of band occupancy there may be little need for a beacon! Perhaps VK could take one of the leaves out of the JA book and use it to help fill up some of the spectrum space which amateurs with suitable equipment do have, but who come on the air only for about one month a year.

AMATEUR TV

A letter arrived from Noel, VK5EI (ex-VK3AGF) who works and lives at Ceduna, on the far west coast of S.A. (the same area as Kerry VK5SU), which was too late for inclusion in last month's notes. Noel is very interested in running skeds, over a long period, with a view to increasing the present ATV record. He proposes that as Adelaide, Melbourne, and northern Tasmania are in a direct line from Ceduna, that interested stations in these areas could come on together. He is also interested in skeds to VK6. 40 and 20 metre skeds would be maintained at the same time where practicable.

Present ATV tests are being carried out on 433.3 MHz, but this will be varied according to what other stations are using. Gear consists of modified Pye industrial CCU and camera. Home brew transmitter, wired for ATV, FM and CW at 20 watts. Geelong ATV Club converter, 16 element collinear antenna. It is intended to run 432 MHz carrier, with CW or FM identification as time permits, other than sked times.

Noel asks if interested stations could contact him by letter (Noel Ferguson, 4 George St. Ceduna 5690) or on HF (7130 MHz 0200Z Sundays). Channel 40 FM will also be monitored, beaming east, and for local contacts. Also available this year will be 6 metres SSB using an FTV650, FTDX560 and a 4 element yagi. Good luck Noel with your ambitious projects.

While still in the Ceduna area, a letter from Kerry, VK5SU, contains some news for the coming DX season. He advises his antennas are up, and have withstood various gales so far. Has worked VK3ACM on 6 metres. During skeds on 80 and 40 with VK5PB and VK5MT he has heard their signals from Adelaide on 2 metres every time they have tried, sometimes just in and out of the noise, but the path is 551 km.

Kerry also mentions Bob VK6BE advises "The Albany beacon was put back into service a month ago . . . There is a move to have the beacon (VK6RTW) located on top of Mt. Adelaide, one of the hills in Albany, which also accommodates the 135 MHz tropospheric beacon . . . The six metre beacon has been built and should be on air shortly, all solid state, one watt output . . . The Channel 2 repeater has been operating for some months now. It is located on Mt. Barker at the old beacon site. It is a fairly late model Pye base with solid state receiver . . . there is an improved antenna on the way and should be up before Christmas . . . they hope to extend the present 60 mile radius considerably . . . The W.A. Group are putting a Channel 4 repeater on a hill about midway between Perth and Mt. Barker".

SIX METRES

With the DX just around the corner at the time of writing, there are bound to be a few openings to other areas. HL9WI was the subject of quite a few contacts around Australia when he broke through the barrier around 0300Z on 19/10/74 on 52.010. He was to be on again on Sunday 20/10 but no reports of any working. VK3's also through to VK5 on 29/10 1200Z.

PORTABLE OPERATIONS

With the DX coming, and well here by the time you read this, it now seems the right time to pass on news of various DX-peditions taking place during December and January. Some people have written, others have telephoned, some off-the-air info, and the remainder the grapevine.

Steve, VK3ZAZ, is still hoping to follow through with his planned DX-pedition to Norfolk Island, planning to be away for 5 weeks, but due to accommodation problems, now only three weeks from 2/12/74. He will use the call sign VK3ZAZ/9, and will be operational on 6 metres, listening mainly 52.0 to 52.1, using 52.05 calling freq. (52.1 for benefit of VK2), or if the lower portion of the band gets crowded will operate from crystal position 52.325 MHz. On 2 metres he will call and listen on 144.100. Both bands will be SSB at 400 watts. 432 MHz equipment will also be going along but contacts attempted by appointment only. Site will be on the northern end of Island, about 1,000 feet a.s.l. There will be an official QSL card. VK3TV the official QSL manager. Box 66, P.O. Avoca, Vic.

Steve advises considerable complexity with arrangements, due to remoteness, insufficient accommodation available for that time of the year, uncertainty of arrival date of equipment, escalating costs of air and sea fares, which all adds up to say the above information sets out what is proposed, and confirmation of whether the actual expedition has taken place will be confirmed through the WIA Official broadcasts, there is no other way under the circumstances. Anyway, good luck Steve and Ian, we hope your trip eventuates and proves successful.

NEW ZEALAND

Don ZL3RW sends a brief note advising that a group of Christchurch VHF enthusiasts intend to "ASSAULT VK" on the New Year weekend, intending to go to a location at Denniston near Westport (2000 ft. a.s.l.) on the South Island of New Zealand, operating 2nd to 4th January inclusive. (Pity. The weekend before would probably suit VK better . . . 5LP).

Equipment will be SSB, 52.0 and 144.2 MHz, the usual channels for working VK/ZL. Other working bands to be used will be 80, 40 and 20 metres for liaison for VHF contacts.

MOUNT GAMBIER, S.A.

Colin VK5DK advises there will be portable DX from the Mt. Gambier area again this year, on 28th and 29th December, and could be 30th December if that day is a public holiday. Operating from Mt. William using 6 metres AM and FM, 2 metres SSB and FM, will be Peter VK5ZCW, Robin VK5ZAT, Dale VK5DA and Tony VK5ZCH. Probable call-sign, VK5DA/P.

Another party with Colin VK5DK, Trevor VK5TH Bob VK5ZHR propose operating from The Bluff, using VK5DK/P, and operating 6 metres SSB, 2 metres SSB and FM, and possibly 432 MHz SSB. Operating dates similar to the other party.

VICTORIA

It appears Daryl VK3AQR is arranging for one group to go out portable, no other details available. Mike VK3ASQ proposes to again be on Mt. Cowley for the fourth time. No other details.

Nothing heard from VK2 or VK7. Maybe someone will be going out from VK1, who knows? I don't! In VK6, the Albany area will be the one to watch, where there should be 6 and 2 metre activity, and possibly some 432. Bear in mind also Kerry VK5SU at Ceduna, who is likely to be available much of the interesting operating times for DX.

SOUTH AUSTRALIA

No advice of any other operations than that of my own expedition, starting on 26th December and concluding on 1st January inclusive. Full details of operating equipment was listed in August AR. Some changes are necessary with the passage of time, and the amended information as of this date is as follows: 6 metres SSB, CW and FM. 2 Metres the same. 432 MHz SSB and CW. Calling and listening frequencies: 52.050 SSB, 52.525 FM, 144.100 SSB, Channel 40 FM (146.000) or such other FM channels as required. 432.110 SSB. General practice will be to use the calling frequencies when the band is quiet, but at other times 52.110, 144.110, and 432.110 will be used, with the idea of getting off the calling frequencies to leave them free for other distant places to use and get in on the act. The site for the expedition is Myponga Hill, which is 4 km south east of Myponga, and approximately 54 km SSW of Adelaide, and 479 metres high. It has a good take off in all directions. All Dxers know where to point their beams on Adelaide, so aim a few degrees to the south of that and you will be on Myponga Hill. At this stage it seems 432 MHz gear will be OK but unlikely to make it with 576 MHz this time, still too much schoolwork for enough time to finish the construction work.

THE DX IS COMING

It is for sure. A few helpful hints for those perhaps new to the game, and maybe some others could learn too. Prime requirement:— Good stable, equipment, for both receiving and transmitting, especially the latter. I repeat, good **STABLE** equipment. There are so many narrow bandwidth transceivers around today that they just cannot handle satisfactorily a drifting signal, let alone one with FM on it as well. If you are in doubt about your home built VFO, then arrange for your equipment to accept a crystal oscillator, and switch over to this for the important occasions. A crystal will be OK if you keep out of the bottom 300 kHz when the band is wide open, you would be unlucky to strike someone else's crystal locked on your frequency. If you are running AM, please see your signal is well modulated, very well modulated in fact, if you want to be resolved successfully by those transceivers. Plenty of audio will ensure you are received in the exalted carrier position, and received therefore in the same manner as a sideband signal, using one sideband only — that's why you need modulation. 50 watts of RF carrier at AM with 25 watts of modulation may be OK as far as the text books are concerned, but you will need more than this to be a success with modern SSB receivers. Reduce your carrier signal to about 30 or at the most 35 watts and impress the 25 watts of audio on it — you will be surprised how much louder it sounds. Watch out for splatter however. For correct results, you should use a high pass filter under these conditions and properly adjusted you can run the same amount of audio as RF power in watts and still provide a clean, narrow signal.

And haven't some of you boys ever thought about looking on your own transmitter frequency after calling CQ? Nothing is more frustrating to zero in on someone calling CQ and have him conclude by saying . . . "tuning from the band-edge up . . ." Operators using transceivers will almost invariably be found on your calling frequency, unless they are lucky enough to have an additional VFO to give them split frequency tuning ability, but most prefer transceive these days. Therefore, you chaps

who separately tune the bands, whether you are crystal locked or not, always look on your own frequency first, and say something like this throughout your calling . . . CQ DX CQ DX here is VK . . . calling CQ DX, will be listening this frequency before tuning from band-edge up." You'll save a lot of curses if you do that, and will gain more contacts too, because the other operator will know in advance what you intend doing. If you do wish to tune from band-edge up, then say so during the period of your calling so others will know what you are going to do.

Some AM operators feel true DX stations are not interested in working them. This idea is probably largely mythical, and certainly so if the operator is crystal locked, say on 52.3, and the DX station is on 52.04. All the transceiver operators and others with a VFO will come up on the DX frequency, and that operator will simply work them one after the other for as long as they exist. When he runs out of callers on his own frequency he may tune up the band further and find you. Moral: Build yourself a VFO, or if you don't feel capable of making a stable one, they can be bought ready made, and often using an output range adaptable to most modern transmitters.

And for heaven's sake make sure you have a BFO or a product detector to enable you to resolve SSB. You will soon become branded on the band, and in no uncertain terms, as being the station which cannot resolve side-band. If you cannot resolve such signals it will not be long before there will be almost nobody for you to work, at the present rate AM stations are disappearing from the VHF bands. Perhaps an excuse can be made for an operator not having a VFO, but no BFO seems to be incomprehensible.

Now just a few points about propagation conditions. I guess there is really no need to go into the why's and wherefore's of sporadic E reception on 6 metres particularly, but how this is related to reception of DX on 2 metres might be briefly discussed. It is not always true to say DX on 2 metres will come when Es is at a peak on 6 metres, but nearly always. The most likely time for 2 metre contacts is during a day of intense overall activity, when contacts have been made on 6 metres all around the country. Suddenly, out of the blue extremely strong signal will come in on a short skip path, e.g. Adelaide stations will suddenly find they can work Melbourne. That's the time to think about 2 metres — as the skip distance shortens the MUF (maximum useable frequency) goes up. If you want any confirmation of this, have a look on your TV set, you may well find some stations occupying channels on which you normally see nothing. Channel 3 may suddenly become alive with signals from North Queensland, you may even see something on Channel 5A (which is just below our 2 metre band), or even Channel 6 which is above it. Under such conditions it is possible you may be able to make contacts over paths of 1000 miles or more on 2 metres with very strong signals. Such conditions may only last for a few minutes or even an hour or two, but they don't usually last for lengthy periods. You may find it hard to draw yourself away from 6 metres when everybody seems to be 20 over 9, but believe me, it's worth the effort. The more experienced operators of past years will already know who amongst the interstaters have good 2 metre equipment, and if you keep an ear on these chaps you will learn quite a lot. And while on 2 metres, don't overlook the FM channels, they too can be good pointers to likely long distance operation because they are invariably active, and you don't have to tune for stations. So keep your FM receiver going, just loud enough for you to hear, but not enough to be heard through your microphone. Last season, and I use that word very reservedly, as it's generally acknowledged that the VHF bands never really close, only the operators do! so the word "season" is perhaps a misnomer, but anyway, the FM channels certainly gave a warning of impending 2 metre operation, and were invaluable for this.

So, from all the above, perhaps a few of the less experienced operators might find something to help them enjoy the stirring thrill of working all STATES in one day, perhaps working across to New Zealand, and maybe even making some long distance 2 metre contacts. So good luck!

Well it's Christmas time once again. May I take this opportunity of wishing all my readers the compliments of the season, may you enjoy plenty of DX, and perhaps this coming year you will be able to purchase that piece of sophisticated equipment you have been longing for, now that you have bought the XYL a new washing machine and a fur coat! I hope the notes during the past year have contained something of interest to all of you at some time or other, they have not been prepared without some difficulty during these past two years anyway.

I would like to thank all those kind people who have sent items of interest from time to time, those who have written with news and words of encouragement, and those people, who, as representatives of various Clubs and Groups throughout Australia regularly send me their bulletins, these are very much sought after, and I am thankful to have them. All the best to everyone in 1975.

Closing with the thought for the month: "The only suitable gift for the man who has everything is your deepest sympathy".

The Voice in the Hills. ●

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

The Editor,
Dear Sir,

Often it is said that the law is an ass. Perhaps we, as citizens are donkeys for letting it remain so. It has irked me for years to know how the amateur service is treated by various government authorities in related matters.

I feel that I — as a citizen of the world — have an inherent right to make use of things provided by nature, if I have the will and expertise to do so. One such thing is the EM Spectrum. Provision of this has not cost any government anything, so we should not be beholden for insisting on our rights. Argument is put forward that this spectrum should be used for the public good. Listening on the SW bands — particularly the BC bands — makes one wonder how some of this argument can be substantiated.

In similar vein, argument could be put forward as to why national parks, aboriginal reserves, race courses, golf courses and other recreational playing areas should be converted to housing estates, freeways, aerodromes, etc.

The radio amateur, in using the EM Spectrum does so at his own expense, not costing the government one cent. However he is also improving his technical skills, which are in turn used by government and private concerns. Those skills otherwise would have to be provided for by these concerns — no doubt at some cost.

Perhaps for this reason alone the amateur service should be encouraged, not discouraged.

As a means of propounding goodwill between nations there is not better means.

Friendship is needed between nation and people, for peace to exist in our troubled world. Do governments provide this?

I am of course aware that certain rules are required for orderly conduct.

Statements made by politicians in vouching for our democratic system include that justice is equal to all. I feel somewhat restrained when speaking to other amateur friends, that I cannot speak of some things which could be sent via the normal provided communication services. One reason, I am told, is that these services are provided at great cost to the taxpayer and must be usde.

Therefore, with this reasoning, owners of automobiles should only be allowed to travel around their neighbourhood and use public transport (provided at great expense by the taxpayer) if they wish to go elsewhere. The same principle would also be extended to owners of aeroplanes, and ocean going yachts etc.

We should then, as loyal citizens, use our efforts to see that our privileges are extended to other apparently unaware fellow citizens. These underprivileged people are obviously unaware of the lack of justice they are suffering.

Ray Jepson VK3JI

The Editor,
Dear Sir,

I would like to have recorded in AR my commendation of the WIA morse code course as run during 1974 by Bert VK3BAW. He did an excellent job on the training during a difficult period when the WIA headquarters were being moved from East Melbourne to Brunswick St.

To anyone wanting to pass the PMG CW exam, I would say that if you commence the WIA course under Bert's instruction and put in regular practice, you will pass.

Congratulations for a job done thoroughly and well, Bert! (Incidentally, Richmond Tech.'s rooms are warmer than WIA's).

Graeme Scott, ex VK3ZIP
(VK3?) ●

Key Section

with Deane Blackman VK3TX

Box 382, Clayton, Vic. 3168

My apologies for the absence of this column over the past couple of months.

The winner of the President's cup for 1973 was Jack, VK2CX. Jack becomes the first to receive the cup under the new rules established by the Key Section. Congratulations, Jack.

The Presidents Cup is awarded annually to the amateur who wins the most credit in the four VK contests — the Ross Hull, the John Moyle national field day, the Remembrance Day, and the VK/ZL contests. Since the ease with which points are obtained in these varies quite a bit, the points in each of the above are weighted by factors of 100, 80, 40 and 1 respectively, to bring about the same value in each of the four contests.

It is with regret that I advise that Pete VK5FM, has retired as co-ordinator for the South Australian Division. Pete was the first co-ordinator for VK5 and contributed very much in getting the section set up. Thanks, Pete.

A surprising number of people have responded to my comment about Japanese Morse by sending me letters and articles. I am compiling a contribution for this column on the subject for future publication, but the code is a little incomprehensible without some knowledge of the way the language is written using Roman letters. I want to be a bit surer of my facts on that before flying into print.

Now the VK3 division has a station permanently set up in the science museum, they are naturally keen to have it manned during the times people are visiting the museum. There is a "Black Art" aspect about CW operating which some find fascinating and Vic. Div. would be grateful for any operators who would care to do a bit of pounding in public. It is a standing order I would think; the bands are almost too unreliable to make it worth while going out to the shack at the moment let alone making a trip to the museum.

VK6 tell me they are running slow morse each Monday, Tuesday, Wednesday and Thursday a 2030 local on 3550 kHz. They are operating under the official call sign VK6AWI. VK6NK, who was kind enough to tell me, would appreciate operators to help, and also reports on the transmissions. A good effort, for the various slow morse transmissions available in the eastern states are not much help in VK6.

December brings Christmas, and portable operations. Let me finish by wishing you the appropriate sentiments for the season, and this year not only remind you to pack your key if you go away but to have a sympathetic ear for the weak ones on 80 in January who are not only using wet string in the middle of a mosquito ridden swamp to talk to you, but are draining vital coulombs out of the battery of their automatics to do it. ●

QSP

1974 DRAGS ON

The APO Research Laboratories in Time Service Notice No. 25 advises that the Bureau International de l'Heure has announced that a positive leap second will be inserted in the scale of Co-ordinated Universal Time (UTC) at the end of December 1974. The last minute of 31st December 1974 UTC will be 61 seconds long and the APO's scale of UTC will be adjusted accordingly including a step adjustment to VNG, Lyndhurst.

INDEX TO VOLUME 42

JANUARY - DECEMBER 1974

ANTENNAE

		Page
Feeding MF aerials against ground	Jan.	19
A broad band travelling wave dipole	April	18
Some thoughts on the G5RV	April	14
A 5/8 wave length mobile antenna	May	15
Design of a normal-mode helex antenna	June	15
Further ideas on the ubiquitous G5RV	June	10
Double inverted Vee	June	13
A helical whip for the Ken KP202	Sept.	22
A long wire tuning unit for 80-15	Oct.	13
High Rise Antenna	Dec.	11

RECEIVING

A noise gate converter	Jan.	10
Direct conversion receivers	Feb.	9
Modifications to the R390 A/URR, Part 2	Mar.	18
A solid state front end	May	19
Pre-amp for 28 MHz	May	17
Audio derived AGC for SSB receivers	June	20
Receiver AFC for RTTY	June	11
Transistorised receiver for 160	Oct.	14
What to do with that old receiver	Nov.	18

TRANSMITTERS AND TRANSCEIVERS

simple single side band transmitter	Jan.	5
A visible mute for your car phone	Jan.	18
Good quality CW from the 122	Feb.	25
Modifying the Vinten MTR13 for 2 Mx	Mar.	11
Additional band coverage for Heathkit HW32A	April	13
A linear amplifier	May	18
A 6 metre transceiver	May	14
Multi-Channel switching for Vinten MTR13	May	16
Improvements to FT200	July	10
Transceiver Reciprocity and receiver complexity	July	8
An SL600 Transceiver	Aug.	8
Adding FM to FT200	Aug.	13
Modification to Vinten MTR12 to 52.525	Oct.	22
Modification to Vinten MTR15 to 53.032	Oct.	22
A Digital Readout for Transceivers	Dec.	7

TECHNICAL

An active filter	Jan.	19
An actuator for electronic keyers	Jan.	17
Application of Commercial Kinks to the FT200	Feb.	13
A series mode crystal oscillator	Feb.	15
Flash back 50 years — one battery radio	Feb.	7
Oscar 7 and its capabilities	Feb.	5
FT101 modifications	Mar.	15
Attenuator networks	Mar.	17
Experiments with modulation and audio — Part 1	Mar.	5
Part 2	April	8
Part 3	May	10
Part 4	June	9
Zener diodes from transistors	Mar.	8
2 metre RTTY autostart	Mar.	9
A regulated power supply	July	18
Amateur transmitter interference to tape recorders	Sept.	11
Audio frequency interference (AFI)	Sept.	17
TV Interference from HF stations	Sept.	10
EMP the ultimate EMC problem	Sept.	12
Electronic pollution — An impending crisis	Sept.	8
FM 2 metre repeater details (all Aust.)	Sept.	25
Some thoughts on speech processing	Oct.	12
The International fox tango club	Oct.	23
Some thoughts on regulated power supplies — Tech. correspondence	Oct.	29
Telecommand and telemetry of Oscar 6 and 7 Part 1	Oct.	25
Telecommand and telemetry of Oscar 6 and 7 Part 2	Nov.	10
Telecommand & Telemetry of the Oscar 6 & 7 — Part 3	Dec.	12
VHF-UHF Advisory Committee 70 cm draft plan	Oct.	9
A sheet metal bender	Nov.	6
SSTV Scene — 1974	Nov.	7

GENERAL

Las Balsas — Part 2	Jan.	13
2KO Newcastle	Jan.	11
Intruder watch — summary of stations	Jan.	29
Award hunting — or the paper chase	Feb.	19
Jaunt to Johor	Feb.	14
WIA 2 metre band plan	Mar.	23
Long delayed cosmic echoes or Galactic DX?	Mar.	7
A success story — Japanese Amateur Radio	April	15
Brisbane valley flood disaster	April	10
Is amateur radio necessary?	April	19
A touch of history	May	20
WIA submission to the Independent Enquiry into FM Broadcasting	May	12
The 1973 Murray River Marathon	May	9
Australian VHF, UHF, SHF, records	June	19
A funny thing happened to me in the shack overnight	June	21
Report on the 1974 Easter Convention	June	16
History of a repeater (Gold Coast)	June	14
Some thoughts on mobileering	June	15
Early development of the morse key and code	July	14
Executive office — EDP — AR mailing	July	11
The CW net (CWN) — An explanation	July	13
Oriental FM	July	19
DX Adventure on Willis Island	Aug.	11
Gleanings from a trip to ZL	Aug.	14
Marconi and others	Aug.	17
Diplomacy for Amateurs (re RFI)	Sept.	10
Nothing new — an extract on electrical interference	Sept.	26
Interference — The international scene	Oct.	16
The "Surprise Story" (round world trip details)	Oct.	31
The "Pasatest" Communicating Calculator	Nov.	11
The Wagga Floods	Nov.	12
What are we doing to ourselves	Nov.	17

COMMERCIAL KINKS

The AR7 Part 2	Jan.	24
The AR7 Part 3	Feb.	22
Operating the MR6a from AC	Mar.	23
The Geloso 222	April	21
Heathkit SB100 and SB101	May	22
AC Power supplies for solid state 2 metre transceivers	June	24
Some additions to Ken KP202 Part 2	July	20
A helical whip for Ken KP202	Aug.	15
The FT200 wide band amp	Sept.	22
FT101 VOX operation	Oct.	24
Improved CW operation for the FT101B	Nov.	19
More on the FT200	Nov.	19
	Dec.	18

NEWCOMERS NOTEBOOK

Amateur Examinations	Jan.	22
TVI, BCI, and the Neighbour	Jan.	22
Product detectors for your Receiver	Feb.	26
Equipment layout and design Part 2	Mar.	21
6 metre interference to channel 0	April	20
Some kinks and comments	May	21
"Zero Beat" the YRCS magazine	May	21
2 metre FM Repeaters	June	23
2 metre FM Repeaters	July	20
Audio frequency interference — how it happens	Aug.	16
Hints on receiver maintenance	Sept.	21
Novices	Oct.	24
	Dec.	18

TRY THIS

Battery connectors	Jan.	21
Diode protection for Heath Probe	Jan.	21
Thumb groove indexing the handbook	Jan.	21
Prevent metal fatigue in beam elements	Feb.	13
Drilling glass	Feb.	13
Cleaning and keeping the iron clean	Feb.	13
Binding magazines	Feb.	13
A simple high pass filter	Mar.	21
Drilling booms for Yagis	Mar.	21
True wave length of bands	Mar.	21
Semiconductor heat sinks	April	21
Locating earth wires	April	21
Locating resistors	April	21
Some useful workshop hints	April	21
A QSO filing system	May	21
Aid to soldering	June	24
A 4 phase quadrature split beam mixer	July	21
A multimode detector	Aug.	17
Anti TVI traps	Sept.	21
Antennas can cause interference	Oct.	30
KP202 RF power amplifier	Nov.	19
Substitute Aligning Tool, Backlighting Printed Circuit Boards, Toothpaste Tube Knobs	Dec.	18

PRODUCT REVIEWS

A review of the FT101B	Feb.	16
Review of Ferguson low height transformers	Mar.	16
The Belcom Liner 2 SSB transceiver	April	16
The Spectronics DD1	July	17
Dick Smith Electronics catalogue — 3rd edition	July	25
"Hi-Mound" Morse code hand key	July	21
More on Ferguson transformers	Nov.	21
A Review of the Icom IC22	Dec.	10

INSTRUMENTS

Modifications to the Sakura model TR65	Feb.	21
UHF Dipper	April	19
FM discriminator meter	May	19
Palec VCT modifications	Aug.	12
A monitor scope	Oct.	11

BOOK REVIEWS

"The what, where, who, hassles and how-much book"!	July	25
The ARRL Radio Amateurs Handbook 51st edition	Aug.	26
Interference Bibliography Book on FRI	Sept.	20
Test Equipment for the Radio Amateur	Sept.	23

CONTEST RULES, RESULTS AND AWARDS

A graph of RD contest participation	Mar.	29
"Amateur Radio" awards	April	7
Ross Hull Results	April	23
John Moyle Field day results	May	24
Townsville Pacific Festival Contest 1974 (rules)	May	25
VK-ZL Oceania DX contest 1973 Results	June	22
RD contest rules	July	23
VK-ZL Oceania DX contest rules for 1974	Aug.	20
Gold coast award	Sept.	23
ACE Award	Oct.	26
RD contest address	Oct.	26
Ross Hull Contest Rules 1974	Oct.	32
Townsville Pacific Festival Contest Results	Oct.	31
Results of CQWW contest	Oct.	30
1974 RD contest results	Nov.	22
John Moyle Memorial National Field Day Contest Rules	Dec.	22

Trade Review

The C.T.C. range of RF Power Transistors is now available from Ampec Engineering Co.

C.T.C. has one of the most extensive ranges of RF Power Transistors in the Communications industry. This range of Transistors includes:—

Land Mobile 12V — 50 to 960 MHz, some devices proving 70 watts output.

Hand Held 8V — 175 and 470 MHz.

AM Transistors 13V — 150 MHz up to 120 watts peak.

Military 28V — 80 MHz to 960 MHz devices available.

Linear — Frequency ranges include 2-30 MHz, up to 1000-2500 MHz.

Microwave — up to 3000 MHz with 5 watts output.

A new product listing is available. This listing shows all the devices currently available and standard packages.

As well as this range of devices, several RF amplifier kits are available ready for assembly. These kits include the transistors, all components and printed circuit board. Circuit diagrams with design and assembly hints are also provided.

Contests

with Jim Payne, VK3AZT
Federal Contest Manager,
Box 67, East Melbourne, Vic. 3002

REMEMBRANCE DAY CONTEST

Forty nine certificates have been awarded and these will be posted as soon as possible. About 70 entrants forwarded comments with their logs and many remarks were similar to those from Jim, VK2BO, "This was an excellent contest operated in the best spirit I remember in any contest". Only a few queried the scoring table, usually asking how certain scores were determined. Well, the more one thinks about that scoring table the more involved the problem becomes. Roy, VK2TR says his 2 watt CW transceiver "is a dream to use".

From the gyrations of my own S meter many other stations were killing waits to some order! So, on power alone the scoring chart has deficiencies. Eric, VK3's inward QSL manager has commented "I think the event was better patronised than is usually the case. One growl. The use of BK without signing doesn't help the CW SWL contestant — call signs should be sent at all times". That's a good point, particularly as CW contacts count double.

Murray, VK4KX wrote "Unfortunately once again 28 MHz nil and 21 MHz almost nil". Quite a number of others commented on that situation. Another VK4 with a powerful neighbour suggests contestants should have to QSY after five consecutive QRZ type contacts. John, VK5ZZ/T says 15 and 10 did not open at his QTH. Also a number of local stations using heavy compression made operating at times impossible. Tom, VK5QP writes "It was particularly pleasing to hear so many Z calls working on the 2m FM section of the bands. The contest procedure was very much superior to that heard on 20 metres, where very often stations were failing to confirm numbers received".

Neil, 6FI said "Nothing much heard on 15 and 10. I find the RD the best AR event of the year". Leonard, VK6LG comments "At 73 still enjoy it, but — require two SYT's as log keeper and check sheet". Tom, VK7AL said he enjoyed it immensely as usual. Most of the other comments from VK7 hint secession unless repeaters can be used in the RD and Norman, VK7NR has made out a very good case. Yes Norman, you have "bashed the wrong ear" but the right ear will hear about it. Bruce, VK3AZ found "21 MHz and 28 MHz were virtually non-existent and 7 MHz was not much better". Doug, VK8KK reported similar band conditions, also said "Spirit of contest was truly great, best ever! Clarifiers should be banned or the operators shown how to use them. The number of split frequency QSOs were staggering". Kiwis Frank, ZL4BE, Claude, ZL2KX and Eddy, ZL1ACL all commented about the enjoyment they gained from our contest.

In the August issue of "The Radio Bulletin" in the column headed Editor's Soapbox, the value of contests is questioned. An extract from the final paragraph reads "Is your goodwill increased by working a hundred stations for about thirty seconds each? If so, how? Do you get fun from breaking into contacts already in progress and harassing other stations for numbers? If so, why? Is your goodwill increased when you are driven off a frequency (particularly if it is a net) by stations calling "CQ Contest" over the top of the station you are trying to work? Surely not! Perhaps the value of contests has been exaggerated. What do you think".

Well Glenn, VK6KY covered that question in the letter which accompanied his RD log "It was good to find so many stations who were willing to take the time to give their "handles" this year. Everyone I worked was, at least, very friendly. Given more time to chat, rather than rushing to get numbers across, one could make a lot of new friends. It's a pity that the majority of amateurs don't have the time, other than during the RD, to spend populating our bands. Still, at least, we do have the RD and it gives those of us that have lots of other important things to do as well, an excuse to "forsake all others" and devote our attentions to getting on the air and renewing old friendships and meeting new amateurs. In general, thanks for the RD Contest and may it stay one of the best parts of amteur radio in Australia".

John Moyle Memorial National Field Day Contest Rules - 1975

Amateur operators and Short Wave Listeners are invited to make this contest, held in memory of the late John Moyle, a huge success.

Contestants may participate either as individuals or as part of a group. There are two Divisions in this contest. The first one is for 24 hours continuous operation and the second for any continuous period of six hours. Either period must be within the 26 hours available.

CONTEST PERIOD

From 0600 GMT, Feb. 8th, 1975 to 0800 GMT, Feb. 9th, 1975.

OBJECTS

The operators of portable field stations or mobile stations within the VK call areas will endeavour to contact other portable, mobile or fixed stations in VK, ZL and foreign call areas on all bands.

RULES

1. In each Division there are 8 sections.
   (a) Portable field station, transmitting phone.
   (b) Portable field station, transmitting CW.
   (c) Portable field station, transmitting open.
   (d) Portable field station, transmitting, phone, multiple operation.
   (e) Portable field station, transmitting, open, multiple operation.
   (f) VHF portable field station or mobile station, transmitting.
   (g) "Home" transmitting stations.
   (h) Receiving portable and mobile stations.
2. In each Division, 24 or 6 hour, the operating period must be continuous.
3. Contestants must operate within the terms of their licence.
4. A portable field station must operate from a power supply which is independent of a vehicle or permanent installation.
5. No apparatus may be set up on site more than 24 hours before the contest.
6. All amateur bands may be used but cross band operation is not permitted.
7. Cross mode is permitted but note rule 21.
8. All operators of a multi operator station must be located within approximately an 800 metre diameter circle.
9. Each multi op transmitter should maintain a separate log.
10. All multi op logs should be submitted under one call sign.
11. Only one multi op transmitter may operate on a band at a time.
12. RS or RST reports should be followed by serial numbers beginning at 001 etc.
13. **SCORING FOR PORTABLE FIELD STATIONS AND MOBILES.**
    Portable field stations and mobiles, outside entrants call area—15 points.
    Portable field stations and mobiles within entrants call area—10 points.
    Home stations outside entrants call area—5 points.
    Home stations within the entrants call area—2 points.
14. **SCORING FOR "HOME" STATIONS**
    Portable field stations outside entrants call area—15 points.
    Portable field stations within entrants call area—10 points.
15. Portable field stations may contact any other portable field station twice on each band (10-160) during the period of the contest provided that four hours elapse after the previous contact with that station on that band.
16. VHF portable-mobile field stations may contact any other VHF portable-mobile field station repeatedly provided that two hours elapse after the previous contact on that band.
17. Operation via active repeaters or translators is not acceptable for scoring.
18. All logs shall be set out under headings of Date-time in GMT, Band, Emission, Callsign, RST sent, RST received and Points claimed. List contacts in correct sequence. There **must** be a front sheet to show . . . Name, address, division, Section, call sign, call signs of other operators, location, points claimed, equipment used and power supply. You must also certify that you have operated in accordance with the rules and spirit of the contest.
19. Certificates will be awarded to the highest scorer of each section of the 6 hour and 24 hour divisions. The 6 hour certificate cannot be won by the 24 hour entrants. Additional certificates will be awarded for excellent performance.
20. Entrants in sections a, b, c, d, e and f must state how power for transmitting is derived.
21. All CW-CW contacts count double. Cross mode contacts do not count double.
22. Entries must be forwarded in time to reach the Contest Manager by 21st March, 1975. The address is Federal Contest Manager, Box 67, East Melbourne, 3002.

RECEIVING SECTION

This section is open to all short wave listeners in VK call areas. Rules are as for transmitting stations but logs do not have to show report and serial number of the second station or station called. Logs must show the call sign of the portable or mobile station heard, the report and serial number sent by that station, and the call sign of the station called. Scoring is as shown in Rule 14 for home stations. A station calling CQ does not count. Portable-Mobile stations, which must be listed in the left hand call sign column of your log, alone count for scoring. Stations in the right hand column may be any station contacted. A certificate will be awarded to the highest scorer of each of the 6 hour and 24 hour divisions, individual or multi operator entries. Certificates will be issued for excellent performance.

RD CONTEST RESULTS

STOP PRESS—Due to mishandling at a post office the following logs which were posted about 16th/19th Sept. were delivered to FCM today 28th Oct. 1974. Subject to confirmation of scores claimed there are new section winners listed here. The first figures are points scored and the second contacts made:—

RECEIVING:	M. Wojtynski (VK2)	142	61
Phone	VK2FM	88	23
	WT	74	28
CW	GT	59	22
Phone	VK3AUG	313	120
	ZML	219	129
	PW	158	49
	ARS	137	77
	SX	33	23
	VK5ZFJ	101	101
	ZAP	56	56
	VK6DG	368	177
	II	360	256
	AB	218	94
	ZDA	200	202
	WA	114	50
	VK7LP	1096	510
	VK8AS	528	119
OPEN:	VK7CIC	390	11

CONTEST CALENDAR

December 6 —Ross Hull Memorial VHF-UHF starts. Rules in Oct. AR.
December 7 —TOPS CW.
December 6-8 —ARRL 160 CW.
December 14-15—ARRL 10 metre.
December 14-15—Spanish CW.
December 22 —Hungarian.

TOPS CW CONTEST

1800 GMT Dec. 7 to 1800 Dec. 8.
CW activity between 3.5-3.6 MHz with DX on the low end. RST report only. For details send SASE to FCM.

Awards Column

with BRIAN AUSTIN VK5CA
P.O. Box 71, Craters SA 5152

ADDITION TO ARRL COUNTRIES LIST OF KINGMAN REEF, KP6

Geographically, Kingman Reef is located at the northern-most tip of the Line Islands in the Pacific Ocean. It is owned by the United States. Submissions of Kingman Reef confirmations for DXCC credit may be made starting October 1st, 1974. (Sept. QST).

DMP AWARD

1. The award is available to licensed amateurs and shortwave listeners (on a "heard" basis).
2. Contacts on and after 30th July 1947 are valid.
3. Do not send QSL cards. A list showing full details of the contacts should be certified by the Awards Manager of a National Society.
4. The fee for the award is 10 IRCs.
5. The address for applications is:

   REP
   Av. Marginal 61-1° DE°
   Dafundo-Lisbon 3,
   Portugal.

Requirements:

One confirmed contact is required with each of the following areas:

1.	CT1	Portugal
2.	CT2	Azores
3.	CT3	Madeira
4.	CR3	Port Guinea
5.	CR4	Cape Verde
6.	CR5	St. Tome and Principe
7.	CR6	Angola
8.	CR7	Mozambique
9.	CR8	Port Timor
10.	CR9	Macao

AAA AWARD

1. The award is available to licensed amateurs.
2. Contacts are valid from November 1946.
3. Do not send QSL cards. A list, showing full details of the contacts and the country should be certified by the Awards Manager of a National Society.
4. The fee for the award is 10 IRCs or 50 cents (South African currency). It is, however, issued free of charge to members of SARL.
5. The address for applications is:

   Awards Manager
   South African Radio League
   Post Box 3911
   Capetown
   Rep. of South Africa

Rules: Only mainland stations count. Islands round the coast of Africa are not valid.

Where countries have changed prefix or name, like ZS9 to A2 then either prefix is valid.

Where countries have been subdivided, like French West Africa (FF) — then either the old prefix (FF) is valid or one only of the subdivisions—FF or one (only) of TU, TY, XT, 5T5, 6W8, 5U7, 3X.

Requirements:

Confirmed contacts are required with

ZS1	ZS6
ZS2	ZS7/ZD5/3D6
ZS3	ZS8/7P8
ZS4	ZS9/A2
ZS5	

plus 25 call areas from the list of call areas. ●

Y.R.C.S.

with Bob Guthberlet

3 Bandon Tce., Marino, S.A.

Two excellent publications have been sent for my perusal . . . 'Let's Talk Transistors' and 'Space Science Involvement'. The first deals with the structure of Matter and its applications to transistors, transistor circuits, transistor circuit operation, etc. This is a very useful booklet, published by ARRL. The second, also published by ARRL is a curriculum supplement for classroom use, and outlines Space Science, Physics, Mathematics, Astronomy and Communication. Questions and answers are given at the conclusion of chapters. For the instructor and student I can recommend both. Copies have been sent to the YRCS Federal Education Officer, Allen Dunn, 18 McKinlay Ave., Elizabeth Downs, SA 5113, who can supply further information on cost (one free and one modest in price) and how to obtain them.

The year 1974 is rapidly drawing to a close and supervisors will be seeking statistical information from club leaders. I hope we shall be able to report increased interest and membership. During the YRCS Federal Conference I emphasised the need to publicise the Scheme, as without such we cannot hope to achieve support from the great number of youth, who with greater leisure time than ever before, surely need what we can offer.

This has not been an easy year for YRCS, and the revision of our educational programme has been difficult, mainly due to the uncertain date of the commencement of Novice licensing. Under the guidance of Allen Dunn, we anticipate an improved uniform syllabus for club instructors.

I shall be leaving Kadina on December 31, 1974, and my new address as from early January 1975 will be: 3 Bandon Tce., Marino, S.A. Phone 269 8472.

As this will be my last printed communication for this year, may I wish for all interested in, and working for YRCS, a happy Christmas, and a New Year of successful operation in Clubland. ●

PROJECT AUSTRALIS

with David Hull, VK3ZDH

The following are the "on" orbit equator crossings for Oscar 6 for December. Times are GMT. Days are local.

Orbit No.	Time (Z)	Equator Cross (°W)	Orbit No.	Time (Z)	Equator Cross (°W)
Sun. 1 Dec.			**Mon. 16 Dec.**		
9720	2137	12	9914	0926	189
9721	2332	41	9915	1121	218
9722	127	70	9916	1316	247
Mon. 2 Dec.			**Thurs. 19 Dec.**		
9739	1002	198	9951	820	173
9740	1157	227	9952	1015	202
9741	1352	256	9953	1210	230
Thurs. 5 Dec.			**Sat. 21 Dec.**		
9777	1051	211	9976	815	172
9778	1246	239	9977	1010	200
9779	1441	268	9978	1205	229
Sat. 7 Dec.			**Sun. 22 Dec.**		
9802	1046	209	9982	1945	344
9803	1241	238	9983	2140	13
9804	1436	267	9984	2335	42
Sun. 8 Dec.			**Mon. 23 Dec.**		
9807	2021	353	10001	810	170
9808	2216	22	10002	1004	198
9809	0011	51	10003	1200	228
Mon. 9 Dec.			**Thurs. 26 Dec.**		
9827	1041	208	10039	900	183
9828	1236	237	10040	1055	211
9829	1431	266	10041	1250	240
Thurs. 12 Dec.			**Sat. 28 Dec.**		
9864	936	192	10064	855	182
9865	1131	221	10065	1050	211
9866	1326	249	10066	1245	239
Sat. 14 Dec.			**Sun. 29 Dec.**		
9889	931	190	10069	1830	325
9890	1126	219	10070	2025	354
9891	1321	248	10071	2220	23
Sun. 15 Dec.			**Mon. 30 Dec.**		
9895	2101	3	10089	850	180
9896	2256	32	10090	1045	209
9897	0051	60	10091	1240	238

OSCAR 7

By the time this AR is circulated Oscar 7 (if successfully launched on Oct. 29) should have settled into a normal routine as follows:—

Sundays GMT—Mode A 2m to 10m Repeater on 435 beacon operable.
Mondays GMT—Mode B 70cm to 2m repeater on 145.98 MHz beacon on.
Tuesdays GMT—Mode A.
Wednesdays GMT—Mode D. Recharge mode 435 beacon operable by command.
Thursdays GMT—Mode B.
Fridays GMT—Mode A.
Saturdays GMT—Mode B.

It is hoped to include orbit details in future ARs once orbit parameters are known. Latest information may be obtained from your local state co-ordinator and/or WIA broadcast. ●

CRYSTAL FILTERS - FILTER CRYSTALS - OSCILLATOR CRYSTALS

SYNONYMOUS for QUALITY and ADVANCED TECHNOLOGY

KVG

Listed is our well-known series of [illegible] Hz crystal filters for SSB, AM, FM and CW applications.
By KVG

Matching Oscillator Crystals

XF900	Carrier	9000.0 kHz
XF901	USB	8998.5 kHz
XF902	LSB	9001.5 kHz
XF903	BFO	8999.0 kHz
All crystals		$3.80 ea.
Sockets (FO5)		50¢

Export Inquiries Welcome

SI SPECTRUM INTERNATIONAL
BOX 1084ACONCORD
MASSACHUSETTS 01742
U.S.A.

Filter Type	XF-9A	XF 9B	XF-9C	XF 9D	XF-9E	XF-9M
Application	SSB-Transmit.	SSB Tx/Rx	AM	AM	FM	CW
Number of Filter Crystals	5	8	8	8	8	4
Bandwidth (6dB down)	2.5 kHz	2.4 kHz	3.75 kHz	5.0 kHz	12.0 kHz	0.5 kHz
Passband Ripple	< 1 dB	< 2 dB	< 2 dB	< 2 dB	< 2 dB	< 1 dB
Insertion Loss	< 3 dB	< 3.5 dB	< 3.5 dB	< 3.5 dB	< 3.5 dB	< 5 dB
Input-Output Termination	Z_t 500 Ω C_t 30 pF	500 Ω 30 pF	500 Ω 30 pF	500 Ω 30 pF	1200 Ω 30 pF	500 Ω 30 pF
Shape Factor	(6:50 dB) 1.7	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:60 dB) 1.8 (6:80 dB) 2.2	(6:40 dB) 2.5 (6:60 dB) 4.4
Ultimate Attenuation	> 45 dB	> 100 dB	> 100 dB	> 100 dB	> 90 dB	> 90 dB
Price	$31.95	$45.45	$48.95	$48.95	$48.95	$34.25

In order to simplify matching, the input and output of the filters comprise tuned differential transformers with the "common" connections internally connected to the metal case.

Registration Fee: $1.00; Air Mail: 26c per ½ oz.
Shipping weights: Filters 2 oz ea., Crystals ½ oz ea.
All Prices in U.S. Dollars.

Hamads

* Eight lines free to all W.I.A. members. $6 per 3 cms. for other amateurs and S.W.L.'s.
* Copy should be in block letters or typescript, signed and forwarded to The Editor, P.O. Box 150, Toorak, Vic., 3142.
* Excludes commercial advertising.
* Closing date for Hamads is the 3rd day of the month preceding publication.
* QTHR means the advertiser's name and address are correct in the current Australian Callbook.

FOR SALE

Beckmann DVM Model 4011 RVP with handbook, $20; **Geloso** TR222 AM Transmitter, $20; **AWA MR3** 2m FM with Ch A, C and T, $40. VK3TX, QTHR.

FTDX 400 in good cond., open to any reasonable offer. Apply to Charles Lloyd VK6CZ, 88 Callison Way, Koondoola 6064, W.A.

Bendix Freq-meter BC 221-c, CW 2-1 MHz crystals, 2 books, 2 spare valves & AC-PS, $30; **HB Tape recorder** with 12 - 7" reels of misc. tape, Mic. & Bulk eraser, $15; **AM/CW/DSB Transmitter,** 3 band, 2-807, 80 watt Mod. Sp-amp, and AC-PS (Want the bench space), $20. VK3EM, QTHR. Ph. (03) 58 7745.

AR7 with all coil boxes, power supply with 2 metre converter. Good order $50. WIA NSW Divn. Blue Mts. Branch, c/- VK2BHS, QTHR.

While they last — **AWA Car Phones** FM, Tx and Rx, 70-85 MHz with power supplies, some cables and hand sets. Best offer. See L. D. Sykes, 6 Somme Parade, Edithvale, 3196. Disabled Radio Amateurs' Club VK3ZZ.

150W CW/AM Station. Table top Tx, Geloso with pair of 6146 in final, 80-10m Rx, Lafayette HE30 ant. SW unit with RF meter, switch operation, $125. VK2XD QTHR. Ph. (02) 653 1246.

TCA 1677 hybrid mobile TRx 3/20 final, MPF121 front end, Ch 40 (B) xtals, $80 ONO; **Trio 9R59DS** Rx plus spkr., phones, AR mods, xtal calibrator, $115 ONO; **TCA 1674** remote control base, 6/40 final plus manual, coax, 25 ft. rotatable mast and 2 x 6 over 6 skeleton slot array. Best offer. All must go — heading for G-land in March. Mike VK1ZMV, 13 De Chair St., Deakin 2600. Ph. (062) 81 1312.

WWV Receiver, Beckman 905, crystal locked 2.5, 5, 10, 15, 20, 25 MHz, as new, $75; **Collins** 2300 MHz parametric amp. with control and power unit, spare klystron, $235. VK1VP, QTHR. Ph. (062) 48 5882.

Rx — homebrew, 16 tube double conv., xtal locked, hambands only, 80-10 metres, BFO, noise limiter, inbuilt 240 V PSU, Kokusai mech. filter, $135. B. Hannan, WIA-L3185, 17 Heroes Ave., Emerald, 3782. Ph. (059) 68 4571.

Yaesu FTDX 401 Transceiver, $375; Prop. Pitch Motor AC operated, Selsyn indicator units fittings, and loops for spider triband quad (see QST Dec. 1967), $90. Call or write J. Moyle VK2OZ. Unit 572 Bowden-Brae 50 Pennant Hills Rd., Normanhurst, 2076.

FT-2 Auto. All 8 channels fitted with crystals. Deviation plus-minus 7.5 kHz. No spurious outputs on any frequency. Aerials available, ¼, ½ and ⅝ wavelengths mobile plus coaxial dipole for fixed use. Two manuals, JA and English, in original carton, $375. Ivor Morgan VK3DH. Ph. (03) 82 3020.

Back issues of AR 1949 to date inclusive, good condition. Packed and freight paid, $25. Yeats, PO Box 1088, Orange 2800.

Precision regulated PS, rated at 1.5 amp. at 13.8 V, $18. 2 x QQEO6/40s, 2 x QQEO3/20s, 2 x 6146s, all as new, never used, what offers? Will swap part of foregoing for antenna rotator. VK4ZFM (ex VK2ZKA). Ph. (072) 40 3210. Write: 11 St. Patricks Ave., Kuraby, Qld. 4113.

Antennas, Gem fibreglass quad, Mosley trap vertical 40-20-15-10 metres, Heathkit Marauder transmitter, SSB, AM, FSK, 180 watts PEP, Heathkit OM 12 CRO VTVM, and condenser bridge, all with manuals, 600V/250 mA power supply, 50-100 new valves, 4 x 250 etc., boxes of resistors, capacitors, transformers etc. all new, many other goodies, $400 takes the lot. J. Parsons, 16 Aramac St., Keperra, 4054.

Hallicrafters Comm. Receiver, the famous SX-122A; matching speaker; 100 kHz Plug-in Cryst. Vibrator; Selectivity System. As new, with many refinements. Reasonable offers considered. Dr. (engineer) A. C. Pittas, 14 Manresa Court, Sandy Bay, Tas, 7005.

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CTR 18 Crammond Karphone Circuit/Manual wanted for Serial No. B1587 AM 12 V 7.5 watt. VK3ZLA, 5 The Close, Frankston, Vic. 3199. Ph. (03) 93 0311, AH 783 7717.

Amateur band or general coverage receiver. Write details and price: R. N. Jacob, 429 Kothoff St., Lavington NSW, 2641.

BC348 4 Section tuning gang or incomplete or not working chassis for redevelopment. Command Rx, 7-9 MC wide spaced tuning gang or similar chassis as above. I. D. Stockton VK2AAJ, QTHR. Ph. (02) 48 4721.

R388, R389, SP600 JX, R392, R391. Cond. secondary importance. Spares or incomplete units, technical handbooks. Also US Armed Forces technical manuals, army uniforms, American, even airforce uniforms or pieces, and military badges, etc. PRC9A, 10A, 8A, 28, 74, 77 6. Also SSB receiver adaptor. Dusty Leopold, L5134, PO Box 83, Warradale, 5046.

175 kHz Tapped Osc. Coil. Cheap VLF Rx 10 kHz-500 kHz ADF RAK RBA RBL DZ RE etc. Jeff Silvester, SWL, 30409, 9 Goodwood Drive, Springvale, Vic. 3171. Ph. AH (03) 546 3940.

Campmobile wanted by ZL2AX on DXpedition VK from March 1975. Replies to 20 Thompson Rd., Napier, New Zealand.

AR7 Coil Boxes in good order, full set or singly, condition and price to VK2PT, QTHR.

Valves — Types MS4, 27, DU2, UX250 and X281 for use in restoring a rather elderly wireless. Peter, VK2ZPX, QTHR. Ph. (058) 81 1253 AH.

Exchange Eddystone 770R Mk. II VHF Rx 19-165 MHz in very good condition, with workshop manual, for any HF gear or will sell. Particularly want linear with PSU suitable for following a KW2000A. Bill Senior, VK2BZA, "Birkenau", Bundarra Road, Armidale, 2350. Ph. (067) 75 1158.

Details of small SSB/CW 20 and 40m "back-pack" rig under 5 lb. weight including batteries of a kind available anywhere. Please contact Sam Kaufman, VK2SK, QTHR.

20 Years Ago

with Ron Fisher VK3OM

Technical articles were the main stay of the December 1954 issue of 'Amateur Radio'.

First was 'An Electronic Keyer' by E. A. Marstella VK2AEZ. It was a simple device when compared with todays highly complex solid state keyers. VK2AEZ used only two tubes plus a small AC power supply.

Ladies Beware, or the tale of the purloined tea strainer, was reprinted from the RSGB Bulletin. It told how the XYL's favourite tea strainer was converted into a microphone with the addition of a cheap crystal insert. During the 1950s the old AT5 transmitter was a popular choice in many amateur shacks. Of course it was not ideal in many respects so modifications were many and varied. A. W. Winter VK5DR presented his version with an article entitled 'AT5 Rebuilt and Modified'.

Tom Athey was still at it with his Complete Amateur series "A System For Monitoring your Outfit" told how to construct a simple 'scope' and showed how to connect it to a transmitter to obtain the usual patterns. 'Stable VFO operation at 144 Mc'. Quite a problem in those days. Dr. Robert Black VK2QZ overcame it by using the method of beating a 3MHz VFO against the sixth harmonic of a 7.5 MHz. crystal and the tripling the resultant output to 144 MHz.

Reports for the month include the full results of the 1954 Remembrance Day Contest. Top scorers in each State were VK5MS, VK6TK, VK7LJ, VK3XK, VK4TN, and VK2AKV. This is also the order in which the states finished in contest.

The NSW South Western Zone Convention held at Tumut was described in great detail even to a full list of those attending. ●

Silent Keys

Bob Wookey, VK3IC, passed away in Geelong, on Sunday 29th October. Bob was originally licensed in 1925 and would have been one of the longest standing members of the WIA. He was a foundation member of the Geelong Amateur Radio Club, and served the Committee in various capacities over the 26 years of the club's existence. Bob was active on the HF bands and was always a willing worker in club activities such as working bees, field days and in recent years, the Geelong Hamfest.

Bob will be sadly missed, not only by his many friends in Geelong, but also by those who had made his acquaintance over the air. Our sincerest thoughts go to Bob's sister Edith, brother George, and the remainder of Bob's family.

Alan Bradley, VK3LW
President, GARC

FRANK COX VK2APO

Newcastle & Ham Radio are the poorer for the loss of Frank Cox VK2APO who passed away suddenly in early October aged 62.

Frank enlisted in Army Signals in 1929, was Commissioned in 1939, saw service in the Middle East and New Guinea, was awarded the OBE in 1958 and retired from the Army in 1962.

Since 1962 he has been active on the Air and in WIA as well as being deeply involved in Civic Affairs. He was a member of the Hunter District Water Board at the time of his death.

He leaves a wife Jean and a daughter. He was a good citizen.

VK2KB

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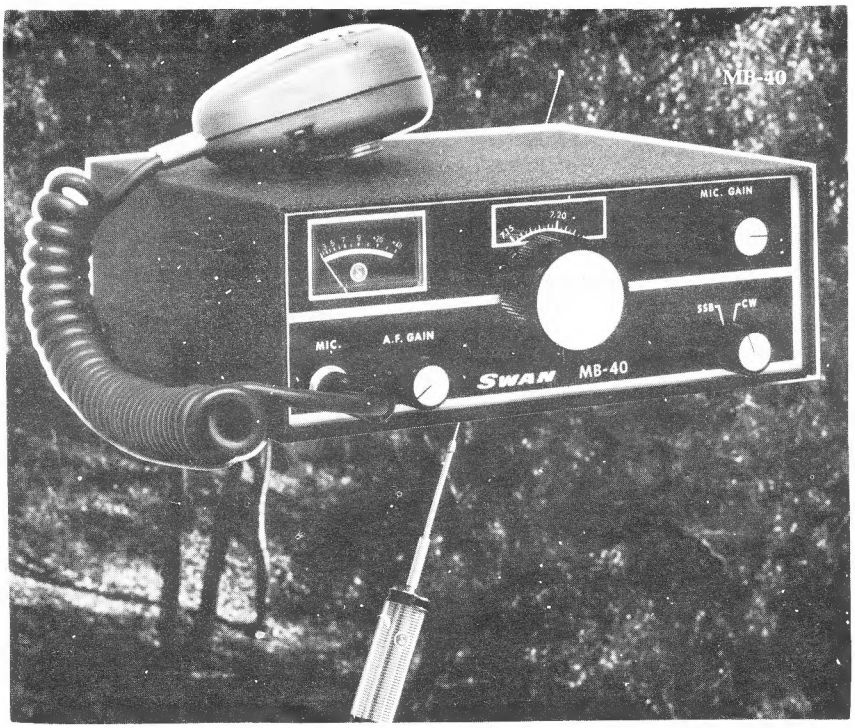

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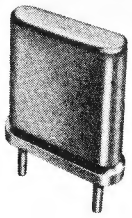

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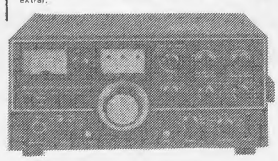

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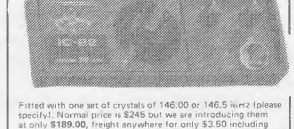

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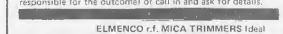

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'Sonic-Solve' solvent	.85c

Ask for FREE cat with your order

MVA100 is a really professional instrument having a large scale 10uA movement. This meter features a 10A ac range as well as dc current. Robust case with carrying handle/bench stand. Mirror scale. If you want the best here it is at **$42.00.**

Ranges:

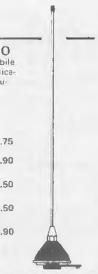
DC Voltages:	0.5V, 2.5V, 10V, 50V, 250V, 500V, 1,000V (100 Kohm/V)
AC Voltages:	2.5V, 10V, 50V, 250V, 1,000V (12.5 Kohm/V)
Decibels:	—20—+62dB
Resistance:	R X 1,0—20 Kohms
	R X 10,0—200 Kohms
	R X 100,0—2 Meg. ohms
	R X 10,000, 0—200 Mohms
DC Current:	10uA, 250uA, 2.5mA, 25mA, 250mA, 10A
AC Current:	0—10A

$42.00

NOTE: All meters should be sent by road freight to avoid damage.

AERIALS — MOBILE RADIO
Gold Standard "Scalar Industries" Mobile whip Antennas for two way radio applications — as used by Police Dept's, Ambulance etc. — including cutting charts — mount through the top through 7/8" dia. hole in vehicle roof. No need to remove roof lining etc.,

M60 Fibreglass	48-78 MHz	¼ Wave	**$10.75**
M12 Fibreglass	70-100 MHz	¼ Wave	**$8.90**
M11 Stainless Steel	70-100 MHz	¼ Wave	**$7.50**
M22 Fibreglass	140-200 MHz	¼ Wave	**$7.50**
M21 Stainless Steel	140-200 MHz	¼ Wave	**$6.90**



KITS

DIGIPACKS These have been produced for counter enthusiasts. A detailed instruction sheet covers the operation of the ICs and how they are interconnected. Clocking, reset and latching are described. Both packs can be cascaded.

TTL 'A' pack has a Datalit 707 display with 7490 BCD counter and 7447 decoder driver and forms the basis of a single decade counter for only **$6.90.**

TTL 'B' pack has the same components as the A pack but also has 7445 latch IC which holds the display while counting. Only **$7.90.**

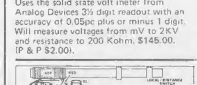
No. 64A Digital Frequency Meter 20 MHz
E.A. December, 1973
Easy to operate with 4½ decade readout via 7 segments LED displays with leading zero suppression. Internal time base is crystal controlled and can be used for self calibration or external calibration as required even while in use! Input impedance 1M ohm shorted by 50 pf and input voltage can vary between 50mV and 10V RMS. Definitely the best and simplest meter on the market. $116.00 (P & P $2.00).

$116

No. 64B 200MHz version
E.A. December, 1973
Same as 20MHz Meter but with a prescaler for VHF work included. Input impedance 50 ohm, sensitivity 800 mV. **$136.00.** (P & P $2.00).

No. 66 Digi Meter Volt/Ohm Meter E.A. October, 1973
Uses the solid state set from Analog Devices 3½ digit readout with an accuracy of 0.05pc plus or minus 1 digit. Will measure voltages from mV to 2KV and resistance to 200 Kohm. $145.00. (P & P $2.00).

$145



REAL SUPERHET TUNER FOR ONLY $7.90
Here's all the basic parts for a 3 transistor superhet tuner. Printed circuit, all coils, ferrite bar antenna, tuning gang, etc. Covers 530 to 1600KHz (thumbwheel dial included). Measures only 45 mm by 135 mm, ideal for converter IF strip (cheaper than parts alone!!). Self-oscillating mixer, 2 stage IF amp with agc into diode detector, NPN transistors and operates off 9V. Why fork out $20, this one is only **$7.90.** (P & P 75c).

No. 46 30W VHF Amp 144 MHz
A complete VHF Amplifier Kit comprising three stages. Definitely not a beginners kit but designed mainly for Amateur use, 30W on 144 MHz with only 300 MW input using a 12.6V supply. Ideal for mobile use. Circuit and instructions supplied. Uses the virtually indestructable 2N5589, 2N5590, 2N5591 VHF Communications Transistors. $39.50 (all P & P 75c).

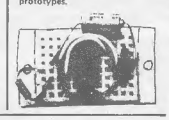
This unit is also available in three separate stages:—

No. 46A	7 watt stage	$12.50
No. 46B	15 watt stage	$14.50
No. 46C	30 watt stage Final Amp.	$18.50

Please Note: Instructions for conversion to 52MHz are available on request. However a separate kit is not available.

Ideal for IC lash-ups.

New Mini IC Breadboard ONLY $3.00. Saves expensive treatment for grey hair and baldness caused by non-functioning prototypes.



GRID DIP METER MODEL TE 15 (FULLY TRANSISTORISED)
This versatile unit operates as a grid dip oscillator, an absorption wavemeter and an oscillating detector. Six coils are supplied with each unit covering the frequency range 360 Kc to 240 Mc. The unit is ruggedly constructed (full metal case) and also very light in weight. Supplied complete with earpiece, meter and full instruction manual — a must for all amateurs —

Specifications

Transistors:	3 and 1 diode
Meter:	500 uA F/S
Battery:	9 volts PP3
Dimensions:	180 x 80 x 40mm
Weight:	730 g
Frequency Range:	440 kc/s — 280 mc/s with 6 coils: A coil 0.44 — 1.3 mc/s, B coil 1.3—4.4 mc/s; C coil 4—14 mc/s; D coil 14—40 mc/s; E coil 40—140 mc/s; F coil 120—280 mc/s.

$41.50 P & P $1.00.

SWR Meter Model SWR-3
Handy SWR meter for transmission antenna alignment, with convenient field strength meter built-in. Suitable for mobile and amateur stations up to 150 MHz. **$15.00.** P & P $1.00.

SWR:	1:1 to 1:3
Accuracy:	5%
Impedance:	52 ohms - 75 ohms
Indicator:	100 uA DC Full Scale
Antenna:	5 section collapsible
Dimensions:	145 x 50 x 60 m/m
Weight:	500 g

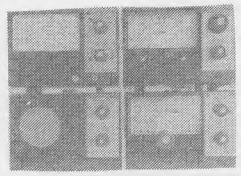
Did you see the Trio review in June E.A.?
Quote "Trio have come up with a very attractive range of instruments that will find many applications . . . They are attractively styled and perform well." Prices include Sales Tax.

VT108 FET VOM 8 ranges 0.5 to 1.5 kV, 11 Meg input, ±3% accuracy. Ohms from 0.1 to 1000 Meg. Memory featu **$85.**

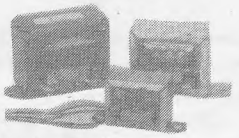
AG202A Audio Generator covers 20Hz to 200kHz 10V rms output. Sine and square wave. External sync. **$94.**

CO1303A 75mm Scope has 20mV cm sensitivity covers DC to 1.5 MHz input R & C of 1 Meg and 30 pF. **$170.**

SG402 RF Generator covers 100 kHz to 30MHz in 6 ranges. Output 0.1V rms. High low attenuator. Modulation at 400Hz. **$76.**



PARTS



Huge Savings on Special D.S.E. "EICO" Transformers
Manufactured for Dick Smith Electronics. Full satisfaction guaranteed.

DSE 2851 240V AC at 12.6V at .15A centre tapped
Normally $6.50 **Special $3.50** P&P 50c **$3.50**

DSE 2155 240V AC to 6.3, 7.5, 8.5, 9.5, 12.6, 15V at 1 amp — an ideal multi purpose power transformer.
Normally $6.50 **Special $4.75** P&P 50c **$4.75**

DSE 6672 240V AC to 30, 27.5, 24, 20, 17.5, 15 or 30V C.T. at 1 amp.
Normally $11.00 **Special $6.50** P&P $1 **$6.50**

DSE GIL-2 240V AC to 18 volts at 6 amps. Designed for 13.8 volts DC power supplies and battery chargers — new "C" core type. **$14.50** P & P $1.

ZIPPY BOXES
Here's the boxes for project builders who want a real professional look to their projects. These boxes are moulded in ABS, so they are tough yet easy to drill. The finish is a posh black with ingenious posts in each corner to take self tapping screws and hold a printed circuit board. They are supplied with a flush fitting aluminium panel which fits all ways round (such is the precision of these boxes). Special panels are also available made of bakelite at **50c** and matrix board at **60c** (**large size only**).

Size **UB1** 15 x 9 x 5 cm **$1.80**
Size **UB3** 12½ x 6 x 4 cm **$1.50**

GRAB THESE

R.F. POWER TRANSISTOR SPECIAL
Huge pre-devaluation purchase of R.F. power transistors from Solid State Scientific enables us to REDUCE prices on these devices. Fully guaranteed, premium quality devices at savings up to $2.00 each.

2N5589 7W was $6.50 NOW $4.90
2N5590 15W was $7.75 NOW $6.90
2N5591 30W was $9.85 NOW $7.50

Set of 3 to give complete chain (see Kits) was $22.50 NOW **$19.25.**

Get together with your friends (or club) bulk purchase and share the savings.

CERAMIC FILTERS
SFD455B (SF455D) the modern replacement of the if transformer. Two resonators are coupled by an external capacitance to give maximum selectivity with a flat response. Typical selectivity 20dB min at ± 10kHz with 3dB bandwidth of ± 4.5 kHz

1-9	10 up
$1.00	$ .80c

SFB455A (SF455B) A resonance type filter for 455kHz to replace the transistor radio if. 3dB bandwidth is 10kHz ± 3kHz; input and output impedance is 3 kohm with a maximum insertion loss of 5 dB.

1-9	10 up
$ .75c	$ .60c

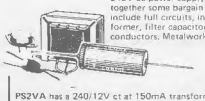
SFB455A (BF455A) Improves selectivity by replacing the emitter by-pass capacitors in transistor if stages. Simplifies alignment and gives long term reliability.

1-9	10 up
$ .80c	$ .50c

YFL455A An if filter which features conventional windings as well as a ceramic filter. Typical selectivity is 19dB down at ± 10kHz with 3dB bandwidth being 5.5kHz min.

1-9	10 up
$2.50	$2.20

DICK SMITH "EICO" POWER SUPPLY KITS
Almost every project you build needs a 240V ac power supply, so we've put together some bargain kits. They all include full circuits, instructions, transformer, filter capacitors and all semiconductors. Metalwork etc. not included.



PS2VA has a 240/12V ct at 150mA transformer and gives 9 or 19V on open circuit. Typical outputs are 6V @ 300mA and 12.6 to 13.6V @ 150mA. Ideal for battery saver or NiCad charger etc., running 9V radios and recorders etc. **$4.95.**

PS15VA uses the PF2155 multitap transformer to give a wide selection of outputs, e.g. 2 to 22V at no load, 4 to 16V @ 1A, 6.3V @ 1½A and many more **$7.25.** (P & P 75c).

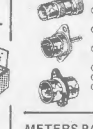
PS121 Reg gives 12V @ 1A, fully regulated and protected by the popular Fairchild 7812 IC. Ideal for projects requiring protection with good regulation and filtering. **$10.25.** (P & P $1.00).

PS5 Reg As the PS121 Reg but gives 5V dc @ 1A for TTL logic projects etc. **$10.25** (P & P $1.00).

PS122 Reg is a completely adjustable, regulated supply for 9 to 12.6V dc @ 2A and uses a 2N3055 regulator transistor. Ideal for running car stereos in the home **$19.75** (P & P $1.50).

PS125 Reg is fully regulated to give under 2mV ripple at full load. Adjustable from 9 to 13.8V dc @ up to 5A. Ideal for bench supply and operating transistorised 2-way radios, etc. Uses 'C' core tranny. 7231C and 2N3055s. Ideal for Amateurs to run mobiles from mains. **$27.50** (P & P $2.50).

McMURDO COAXIAL PLUGS & SOCKETS



	1-9	10 up
COP1 (Belling Lee L734/P) line plug	50c	40c
COS1 (Belling Lee L734/JI line socket	80c	70c
COS2 (Belling Lee L604/S) panel socket	45c	35c
COS3 Insulated panel socket	35c	30c
COS4 PC type socket	35c	30c
COS5 (Belling Lee L616) line or panel power	50c	45c

METERS PANEL MOUNTING
SEW PANELMETERS BY SHINOHARA
The SD range is a high quality precision moving coil meter with a full scale accuracy better than 2%. They all feature the needle pointer with zero adjustment and have provision for internal illumination (miniature bulb required). Finish is clear perspex with black lower section. Mounting by four bolts (nuts supplied).

	1-9	10 up
SD640 (2.5" high x 3.3" wide)		
0 - 50 uA	$8.75	$8.60
0 - 1 mA	$7.80	$7.67
SD460 (1.8" high x 2.3" wide)		
0 - 50 uA	$7.70	$7.60
0 - 1 mA	$7.24	$7.10
V.U. (0dB = 1mW into 600 ohm)	$7.80	$7.40

(P & P 50c each)

MICRO COAX

Miniature Coax
Less than 0.1" diameter high quality coax for wiring miniature transmitters etc. etc. Handles power to 120W, 50ohm impedance 27pF per foot. Only **25c**/ft.

AMPHENOL TYREE
AMPHENOL COAXIAL RELAYS
Designed for receiver and transmitter (up to 2KW) switching — utilises B.N.C. sockets for miniaturisation however; can easily be adapted to UHF. Insertion loss less than 0.1 dB up to .5 GHZ. Weighs only 4 oz., complete with 12 volt coil — a magnificent professional unit at a very economical price.
315-10002-2 **$19.75**

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